ORDNANCE

★ ★

THE MAGAZINE OF SCIENTIFIC AND INDUSTRIAL PREPAREDNESS

VOL. XXXII, No. 168 MAY-JUNE, 1948

FOUNDED 1920

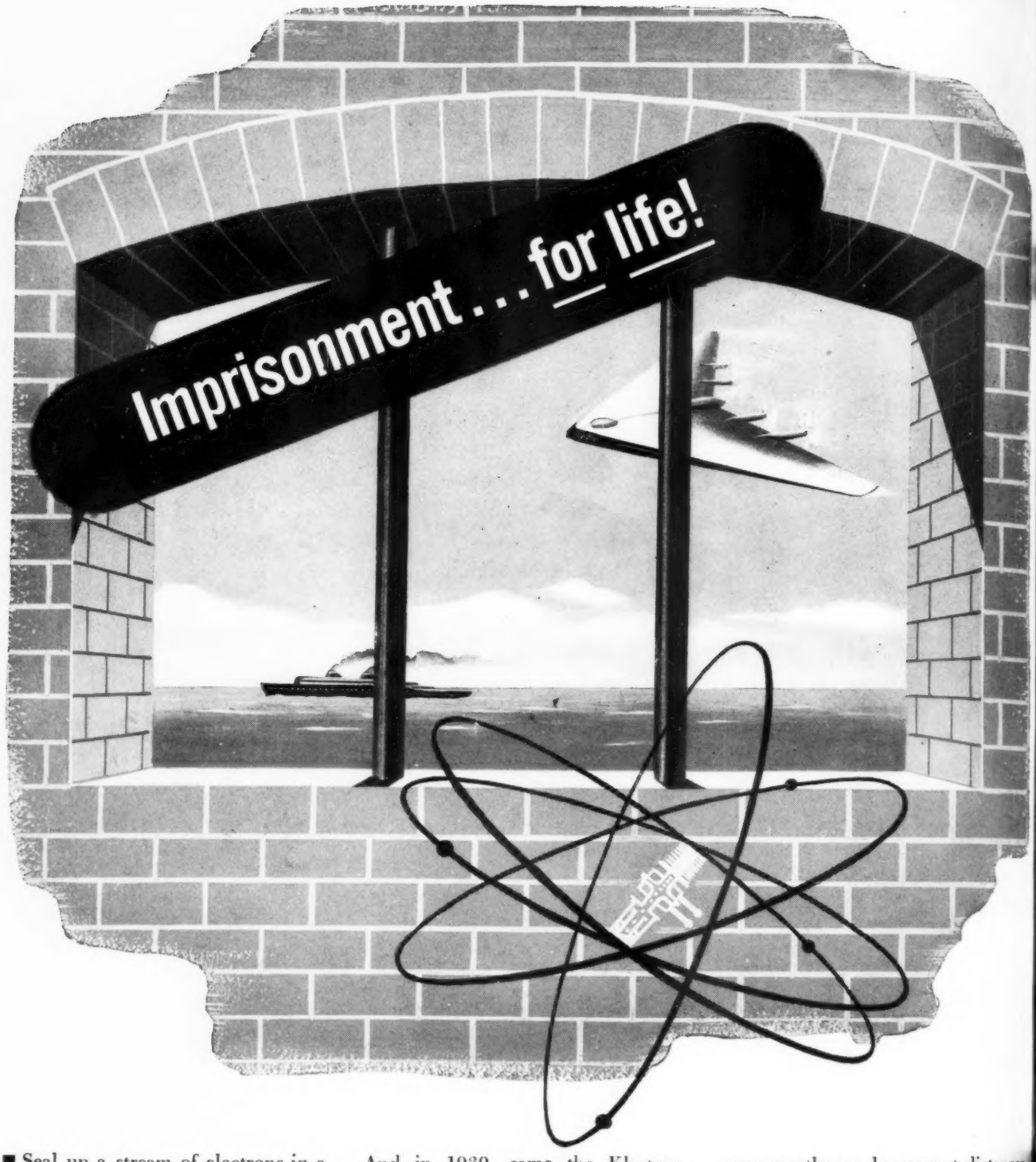
★

IN THIS ISSUE

★

THE JOURNAL OF THE AMERICAN ORDNANCE ASSOCIATION WASHINGTON, D. C.

GENERAL OMAR N. BRADLEY
"Peace is not for sale . . ."



■ Seal up a stream of electrons in a vacuum tube...and you have a space-defying genie that vitalizes industry ...and can save countless lives!

■ As far back as 1930 the Sperry Gyroscope Company put electronics to work . . . introducing electronic control for the Sperry Gyro-Compass.

■ From then on electronics was employed whenever it could extend the usefulness and performance of Sperry products—as in automatic pilots, gun fire control devices, navigation instruments, both aeronautical and marine. And in 1939, came the Klystron, "heart-beat" of Radar.

■ In war, Radar tracked out enemy plane, sub and ship positions, saving numberless lives by advance warning of hostile attack. And today, in peace, Radar brings new safety to mankind... plotting aerial and marine operations with pin-point accuracy, through pea-soup weather and over vast distances.

■ Sperry pioneered in helping develop these and many other services for mankind. But "pioneering" isn't enough. And that's why Sperry research and practical applications of electronics go endlessly on . . . in that search for something better which we call *product improvement.*

SPERRY GYROSCOPE COMPANY

DIVISION OF THE SPERRY CORPORATION • GREAT NECK, N.Y.

NEW YORK · CLEVELAND · NEW ORLEANS · LOS ANGELES · SAN FRANCISCO · SEATTLE

Founded 1920

ORDNANCE

Combined with Logistics

THE JOURNAL OF THE AMERICAN ORDNANCE ASSOCIATION

FEATURES

Push Button Warfare . . . . . Frontispiece
Strategy in the Atomic Age 373
Economic Mobilization 374
HANSON W. BALDWIN
The Air University 377
MAJ. GEN. DAVID M. SCHLATTER
The Nuremberg Trials 379
MAJ. GEN. J. F. C. FULLER
The Cut Back Club 382
Industrial Readiness 383
REAR ADM. WARREN S. PARR
Industry-Ordnance Leaders 385
Essentials of Security 386
ARTHUR M. HILL
Research for Security (Pictorial) 389
Air Power in Total War 393
LEO A. CODD
The Naval Ordnance Laboratory 395
DR. RALPH D. BENNETT
The Growth of Rocket Ordnance 397
F. W. F. GLEASON
Thirtieth Annual Meeting, A.O.A. 400
AN ANNOUNCEMENT
Month by Month 401
Program for Peace 403
BERNARD M. BARUCH
Michigan Post Sets Its Sights 404
ROBERT L. BIGGERS

DEPARTMENTS

New Developments . . . 364
Association Affairs . . . 405
Honor Roll of Industrial Preparedness 407
The National Divisions, A.O.A. 411
Communications 412
Book Reviews 416
Index of Advertisements . 423

Vol. XXXII MAY-JUNE, 1948 No. 168

ORDNANCE is published bimonthly by the American Ordnance Association, 705 Mills Building, Washington 6, D. C. Entered as second-class matter, August 14, 1920, at the Post Office at Washington, D. C., under the Act of March 3, 1879. Additional second-class entry at the Post Office at Richmond, Va. Subscription rate: continental U. S. and possessions, $4.50 annually, in advance; foreign, $6.00. Copyright 1948 by the American Ordnance Association. Six weeks' notice before next publication date required for change of address.

Editor: Leo A. Codd. Managing Editor: R. E. Lewis. Editorial Staff: M. L. Van Horn, J. J. O'Connor, R. P. Hines.

Advertising representative: Mr. Thomas O. Woolf, 1 Park Avenue, New York 16, N. Y.

ORDNANCE has no official or semiofficial governmental status. All statements expressed in the articles, editorials, and advertisements are those of the authors, editors, and advertisers and do not represent official governmental policy.

THE LONG-RANGE AIMS AND PURPOSES OF THE AMERICAN ORDNANCE ASSOCIATION

1. Adequate national security. This is the great goal of peace. It is best obtained through a nonpartisan and persistent national policy which will ensure that the amount of military power—ground, sea, and air—available to this country and its probable friends will never be less than that available to its probable enemies.

2. Adequate munitions power. This is one of the two basic foundations of military power. The amount of it in quality and quantity available to the United States and its probable friends for timely and effective use should never be less than that available to its probable enemies.

3. Adequate military man power. This is the other main foundation of military power. The amount of it available to the United States and its probable friends should likewise never be less than that required for the timely and effective utilization of the munitions power essential to victory.

4. An ideal basis for achieving adequate munitions power. Existing stocks of munitions plus expected production should equal requirements both in quantity and quality at all times. Consequently, the more the United States can depend upon and speed up the mobilization rate of American industry, the smaller the stocks we have to maintain, the more up to date our munitions in time of conflict, and the less the cost.

5. To achieve the above objectives the following principles are advocated:

a. Designs of military armament that are second to none.

b. Existing stocks of combat and other munitions that are adequate in quantity and quality.

c. Efficient and dependable industrial mobilization with maximum shortening of the time factors involved, including the political time factor, the administrative time factor, and the industrial time factor.

d. Current and constant education, training, and development of the military-science-industry team.

—The Editors

NATIONAL AND REGIONAL OFFICIALS AND L

Officers.—President: James L. Walsh, New York, N. Y. Vice-Presidents: Herbert A. Gidney, Pittsburgh, Pa.; Harvey C. Knowles, Cincinnati, Ohio. Treasurer: Henry P. Erwin, Washington, D. C. Counsel: John Ross Delafield, New York, N. Y.

Directors.—W. W. Coleman, Milwaukee, Wis.; Benedict Crowell, Cleveland, Ohio; Henry P. Erwin, Washington, D.C.; H. A. Gidney, Pittsburgh, Pa.; R. E. Gillmor, New York, N. Y.; C. J. Ingersoll, Philadelphia, Pa.; K. T. Keller, Detroit, Mich.; H. C. Knowles, Cincinnati, Ohio; R. P. Lamont, New York, N. Y.; F. H. Payne, Springfield, Mass.; F. A. Scott, Cleveland, Ohio; John Slezak, Sycamore, Ill.; J. L. Walsh, New York, N. Y.; C. D. Wiman, Moline, Ill.

Advisory Board.—H. W. Alden, Detroit, Mich.; J. D. Biggers, Toledo, Ohio; G. W. Elliott, Philadelphia, Pa.; R. E. Gardner, Jr., St. Louis, Mo.; Earl B. Gilmore, Los Angeles, Calif.; T. M. Girdler, Cleveland, Ohio; A. W. Herrington, Indianapolis, Ind.; B. T. McNeil, Houston, Tex.; T. A. Morgan, New York, N. Y.; S. E. Reimel, New York, N. Y.; C. H. Tenney, Springfield, Mass.; J. W. Wadsworth, Geneseo, N. Y.; C. E. Wilson, New York, N. Y.

Council.—H. W. Alden, Detroit, Mich.; C. D. Ammon, Lincoln, Nebr.; A. J. Armstrong, Natchez, Miss.; F. B. Bell, Pittsburgh, Pa.; J. H. Burns, Washington, D.C.; W. M. Canaday, Toledo, Ohio; W. W. Coleman, Milwaukee, Wis.; Benedict Crowell, Cleveland, Ohio; Harry Darby, Kansas City, Kans.; C. K. Davis, Bridgeport, Conn.; A. G. Drefs, St. Louis, Mo.; C. W. Dupuis, Cincinnati, Ohio; E. B. Gallaher, Norwalk, Conn.; H. A. Gidney, Pittsburgh, Pa.; R. E. Gillmor, New York, N. Y.; R. F. Gow, Worcester, Mass.; E. T. Gusheé, Detroit, Mich.; T. S. Hammond, Chicago, Ill.; J. M. Hancock, New York, N. Y.; Arnold Hanger, New York, N. Y.; F. D. Hansen, Milwaukee, Wis.; F. J. Hinderliter, Tulsa, Okla.; S. C. Hope, Springfield, Mass.; C. J. Ingersoll, Philadelphia, Pa.; J. E. Kanaley, Chicago, Ill.; W. S. Knudsen, Detroit, Mich.; F. B. Lee, Seattle, Wash.; W. C. MacFarlane, Minneapolis, Minn.; E. B. Meissner, St. Louis, Mo.; E. F. Norelius, Springfield, Ill.; K. T. Norris, Los Angeles, Calif.; L. S. Oakes, Minneapolis, Minn.; Walter Pew, Philadelphia, Pa.; F. A. Scott, Cleveland, Ohio; R. C. Scott, San Francisco, Calif.; F. J. Smith, Rochester, N. Y.; Ross Stewart, Houston, Tex.; H. M. Tillinghast, New York, N. Y.; J. E. Trainer, Akron, Ohio; J. L. Walsh, New York, N. Y.; T. J. Watson, New York, N. Y.; H. A. Winter, Denver, Colo.; Dean Witter, San Francisco, Calif.; S. H. Woods, Aberdeen Proving Ground, Md.

National Headquarters.—Executive Vice-President: Leo A. Codd. Secretary: F. G. Ferriter. Assistant Treasurer: M. F. Ferriter. Director National Activities Divisions: Burton O. Lewis. Book Service: J. J. O'Connor. Ordnance Professional Men's Service, T. L. Begun. Staff Assistants: G. C. Anderson, G. M. Crump, K. C. Hankey, E. M. Purks, K. H. Stevens, M. J. Webb, N. A. Woodhouse.

Officers of the Local Chapters

Aberdeen Proving Ground, August 16, 1944

President: Charles McKnight. Vice-President: F. D. Dolan. Directors: T. F. Colleran, L. A. Delsasso, G. B. Jarrett, L. C. Josephs, T. E. Sterne, R. P. Witt. Treasurer: C. W. Clark. Secretary: L. W. Nederkorn, Aberdeen Proving Ground, Md.

Birmingham, December 3, 1930

President: T. M. Nesbitt, Jr. Vice-President: H. P. Bigler. Directors: Robert Gregg, T. E. Kilby, Jr., T. W. Martin, M. E. Pratt, Allen Rushton, R. J. Stockham, Oscar Wells. Treasurer: R. D. Cotten. Secretary: R. E. Parker, 700 Frank Nelson Building, Birmingham 3, Ala.

Central Illinois, May 29, 1945

President: L. P. Weiner. Vice-President: J. R. Munro. Directors: J. M. Barkman, S. S. Battles, M. C. Budlong, F. E. Martin, Emil Norelius, V. T. Wissen. Treasurer: Merle Yontz. Secretary: Robert Hafer, Peoria Association of Commerce, Peoria, Ill.

Chicago, May 3, 1924

President: John Slezak. Vice-President: H. J. Prebensen. Directors: E. J. Bush, W. E. Crocombe, Thomas Drever, T. S. Hammond, H. P. Isham, J. W. Karraker, James Knowlson, Fowler McCormick, F. W. Parker, Jr., W. G. Swartchild, Jr., W. R. Wright. Treasurer: G. D. Dearlove. Assistant Treasurer: G. R. Catlett. Asst. Sect.: E. J. O'Keefe. Secretary: M. J. Allen, Room 1410, 400 N. Michigan Avenue, Chicago 11, Ill.

Cincinnati, December 10, 1925

President: L. W. Scott Alter. Vice-Presidents: R. G. Calton, J. C. Shouvlin. Directors: R. K. Brodie, R. H. Ferger, F. V. Geier, E. R. Godfrey, E. A. Muller, Louis Polk, A. H. Pugh, Jr., Louis Ruthenburg. Secretary-Treasurer: C. H. Wood, Big Four Building, Cincinnati 2, Ohio.

Cleveland, October 25, 1940

President: Ward M. Canaday. 1st Vice-President: J. C. McHannan. Directors: R. F. Black, F. H. Chapin, F. C. Crawford, D. S. Ellis, William Forster, B. F. Hopkins, A. D. Joyce, Frank Purnell, H. A. Roemer, G. W. Stephens, W. R. Timken, J. E. Trainer, A. J. Weatherhead, Jr., C. M. White, Clyde Williams. Secretary-Treasurer: E. A. Lynn, 6200 Riverside Drive, Municipal Airport, Cleveland 30, Ohio.

Empire, April 29, 1938

President: F. J. Smith. Vice-Presidents: E. A. Halbleib, Keith Williams. Directors: G. W. Cole, C. F. Dietz, R. E. Dillon, J. E. Gleason, E. A. Halbleib, C. S. Hallauer, M. J. Hayes, F. F. Hickey, C. H. Lang, T. L. Lee, E. Norquist, F. J. Smith, D. W. Sowers, K. Williams. Treas.: E. R. Davenport. Acting Sect.: R. C. Hands, 1258 Sibley Tower Bldg., Rochester 4, N. Y.

Hartford-Springfield, November 18, 1941

President: S. C. Hope. Vice-Presidents: J. H. Chaplin, E. B. Gallaher, C. H. Granger. Directors: F. H. Payne, *chairman;* G. H. Anthony, M. K. Barroll, Jr., J. S. Begley, E. P. Bullard, J. H. Chaplin, F. U. Conard, C. K. Davis, E. B. Gallaher, W. M. Goss, C. H. Granger, S. C. Hope, L. E. Lentz, D. G. Millar, C. B. Parsons, H. H. Pease, R. E. Pritchard, E. S. Pugsley, J. Y. Scott, H. W. Steinkraus. Secretary-Treasurer: J. A. MacDonnell, Gilbert & Barker Mfg. Co., West Springfield, Mass.

Lehigh-Bethlehem, November 15, 1939

President: M. K. Ament. Vice-President: F. L. Meinhofer. Directors: L. J. Bray, Mark Parseghian, P. K. Reily, Jr., W. O. Snelling, R. W. Steinmetz, R. M. Webster, Jr. Secretary-Treasurer: J. A. Tallmadge, Jr., 416 Drinker House, Lehigh University, Bethlehem, Pa.

Lone Star, June 12, 1945

Acting President: H. S. Zane, Jr. Directors: E. H. Brooks, G. H. Brown, S. P. Hamer, A. A. Hardy, F. L. Lebus, G. G. McDonald, Charles Medley, F. A. Pierce, H. S. Zane, Jr. Secretary-Treasurer: W. M. Harrison, 1111 Foch Street, Fort Worth, Tex.

Los Angeles, May 27, 1936

President: W. C. Main. Vice-President: M. M. Mitchell. Directors: H. L. Clark, R. O. Cragin, Trevor Gardner, W. C. Main, M. M. Mitchell, C. H. Nazro, K. T. Norris, Morris Pendleton, J. B. Rauen, S. K. Rindge, John Spalding, R. H. Taylor, Phillip Thayer, H. C. Thomas, Carleton Tibbetts. Treasurer: S. K. Rindge. Secretary: C. H. Nazro, P. O. Box 2262, Terminal Annex, Los Angeles 54, Calif.

LOCAL POSTS OF THE ASSOCIATION

Massachusetts Institute of Technology, January 20, 1922

President: T. W. Folger. Vice-President: A. R. Pfeiffenberger. Directors: G. J. Hossfeld, J. J. Moran, Jr., J. M. Wilson. Treasurer: R. K. Pitler. Secretary: E. A. Scott, Massachusetts Institute of Technology, Cambridge 39, Mass.

Michigan, December 12, 1942

President: R. L. Biggers. 1st Vice-President: Oscar Webber. 2nd Vice-President: C. T. Fisher, Jr. Directors: H. W. Alden, R. L. Biggers, R. P. Briggs, G. T. Christopher, M. E. Coyle, G. R. Fink, C. T. Fisher, Jr., H. C. Fruehauf, E. T. Gusheé, Phil Huber, K. T. Keller, G. W. Kennedy, S. T. Stackpole, Oscar Webber, A. M. Wibel. Secretary-Treasurer: J. W. Paynter, 1206 Woodward Avenue, Detroit 26, Mich.

Mid-Continent, December 12, 1944

President: Frank Hinderliter. 1st Vice-President: R. R. King. 2nd Vice-President: George Nicholson. Directors: The officers and M. H. Johnson, H. E. McCray, Walter O'Bannon, Jr., W. W. Siegrist, W. H. Stueve, Ed Warmack. Secretary-Treasurer: C. R. Horton, 510 S. Lansing Avenue, Tulsa 5, Okla.

Midwest, May 16, 1945

President: Harry Darby. 1st Vice-President: J. C. Shepherd. 2nd Vice-President: C. M. Standiford. Directors: L. M. Alexander, P. A. Froeschl, P. F. Rahm, R. M. Williams, E. J. Ziegler. Secretary-Treasurer: F. B. Nichols, 1921 Central Street, Kansas City 8, Mo.

Milwaukee, September 26, 1928

President: F. D. Hansen. Vice-President: N. R. Knox. Directors: F. R. Bacon, P. H. Batten, L. R. Clausen, W. W. Coleman, J. E. DeLong, H. S. Falk, G. H. Fobian, Walter Geist, F. D. Hansen, H. S. Johnson, Jr., N. R. Knox, H. V. Kohler, J. C. Merwin, R. A. Uihlein, P. J. E. Wood. Secretary-Treasurer: Jacobus Kruyne, Marshall & Ilsley Bank, 721 N. Water Street, Milwaukee 2, Wis.

Nebraska, June 22, 1944

President: C. D. Ammon. Vice-President: W. S. Byrne. Directors: D. C. Bradford, Ben Hughes, C. L. Kirkland, J. L. McCague, K. E. Vogel. Secretary-Treasurer: F. G. Arkoosh, 1305 Farnam Street, Omaha 2, Nebr.

New York, June 15, 1921

President: H. M. Tillinghast. 1st Vice-President: C. S. Comeaux. 2nd Vice-President: J. E. McNary. 3rd Vice-President: T. E. Murray. 4th Vice-President: J. T. Mackey. Executive Committee: The officers and T. F. Brown, W. A. Davidson, R. E. Gillmor, C. J. Hardy, C. W. Keuffel, D. B. MacMaster, R. L. Maxwell, Chester Mueller, Whitney Stone, A. E. Van Cleve. Treasurer: Crosby Field. Secretary: Edward Gluck, 111 East 16th Street, N. Y. C.

Northwest, March 15, 1945

President: W. C. MacFarlane. Vice-Presidents: Harold Sweatt, Charles Horn. Directors: A. P. Baston, Fred Blumers, P. G. Bourne, C. E. Buckbee, R. P. Carlton, C. L. Horn, W. F. Kasper, L. S. Oakes, D. W. Onan, G. H. Rozum, W. G. Seeger, D. A. Smith, A. V. Stallard, H. A. Washburn, A. M. Wilson, F. B. Winston, Brison Wood. Secretary-Treasurer: R. F. Wilson, Palace Building, Minneapolis 1, Minn.

Philadelphia, December 9, 1926

President: W. J. Meinel. Vice-Presidents: G. W. Elliott, D. N. Hauseman, C. J. Ingersoll, T. D. Barney. Directors: G. M. Barnes, E. G. Budd, Jr., G. W. Elliott, H. W. Gadsden, H. P. Gant, A. W. Gilmer, C. H. Godschall, D. N. Hauseman, L. E. Hess, C. J. Ingersoll, Ralph Kelly, E. J. Langham, W. J. Meinel, R. P. Page, Jr., W. C. Pew, C. S. Redding, Wilbert Wear. Secretary-Treasurer: W. F. Feustel, 261 North Broad Street, Philadelphia 7, Pa.

Pittsburgh, February 24, 1927

President: H. C. Minton. Vice-Presidents: J. K. B. Hare, T. E. Millsop. Directors: The officers and F. B. Bell, R. C. Downie, W. K. Fitch, H. A. Gidney, L. Iversen, A. E. Walker, I. E. Wilson. Treasurer: T. H. Eddy. Secretary: W. S. Rial, Jr., 1312 Highland Building, Pittsburgh, Pa.

Puget Sound, January 25, 1944

President: Ferdinand Schmitz, Jr. 1st Vice-President: H. P. Lawrence. 2nd Vice-President: Robert Nelson. Directors: Frank Berry, John Cannon, Edward Colbert, L. B. Cooper, J. A. Denn, Watt Fallis, Alexander Finlayson, Henry Isaacson, G. E. Lamb, F. B. Lee, A. F. Parker, W. F. Schiessl, F. W. Schmidt, Walter Toly, R. O. Welch. Secretary-Treasurer: C. W. Huffine, 414 White Building, Seattle 4, Wash.

Quad Cities-Iowa, May 28, 1945

President: T. E. Stahl. Vice-President: E. W. Ross. Directors: Frank Anderson, R. E. Choate, J. H. Diedrich, L. M. Gildea, Henry Lord, K. E. Madden, Fred Maytag, II, C. R. Sheaffer, George Uhlmeyer, C. A. Waldmann, G. L. Weissenburger, C. D. Wiman. Secretary-Treasurer: Donald Meyers, Rock Island Arsenal, Rock Island, Ill.

Rocky Mountain, June 10, 1942

President: Watrous C. Redfield. Vice-President: James Colasanti. Directors: Alfred W. Ainsworth, J. Leslie Brown, Fred R. Eberhardt, Benjamin C. Essig, Joe K. Garretson, Robert P. Gutshall, James D. Maitland, William M. Reno, G. A. Savin. Secretary-Treasurer: W. E. Lipsey, 4936 Elm Court, Denver, Colo.

St. Louis, January 18, 1927

President: Edwin B. Meissner. Vice-President: Clyde H. Morgan. Directors: W. M. Akin, Ben Comfort, H. B. Deal, R. E. Gardner, Jr., Spencer Olin, W. S. Symington, P. J. Watson, Jr. Secretary-Treasurer: M. F. Hubbell, 4800 Goodfellow Boulevard, St. Louis 20, Mo.

San Francisco, October 17, 1923

President: W. A. Starr. Vice-Presidents: E. A. Julian, R. M. Alvord. Directors: R. C. Force, K. B. Harmon, E. A. Julian, C. E. Moore, Carl Wente, C. S. Wheeler, Jr., Dean Witter. Secretary-Treasurer: R. L. Bidwell, P. O. Box 567, 100 McAllister Street, San Francisco 1, Calif.

Texas, October 30, 1942

President: F. M. Wittlinger. Vice-President: Herman Brien. Directors: W. O. Hedrick, E. D. Konken, D. J. Martin, L. B. Ryon, R. H. Startzell, Ross Stewart. Secretary-Treasurer: L. S. Bassett, P. O. Box 2545, Houston 1, Tex.

University of Michigan, February 20, 1941

President: L. E. Girton. Vice-President: R. W. Parkinson, Jr. Treasurer: H. J. Newman. Secretary: A. W. Ott, 213 Hinsdale House, Ann Arbor, Mich.

Washington, November 18, 1925

President: F. W. Foster Gleason. Vice-Presidents: C. M. White, Philip Schwartz. Advisory Board: Donald Armstrong, H. P. Erwin, C. T. Harris, Frank Macconochie, Earl McFarland, C. M. Wesson, F. E. Wright. Directors: H. T. Bodman, W. F. Byrne, R. C. Coupland, Bourbon Dawes, Harry Diamond, A. H. Ferrandou, T. G. Gentel, B. R. Lewis, A. W. Mace, H. H. Mitchell, A. A. White, R. P. Williams. Secretary-Treasurer: H. J. Crager, 610 H Street, Washington 2, D. C.

Yankee, June 30, 1925

President: J. S. Crawford. 1st Vice-President: F. L. Felton. 2nd Vice-President: H. W. Bagnall. 3rd Vice-President: F. W. Knauth. Directors: J. P. Spang, Jr., *chairman;* H. S. Chafee, Ralph Gow, R. N. Greenwood, Richard Morse, J. L. Martin, G. W. Sweet, Thomas West, R. F. Williams. Secretary-Treasurer: G. P. Slade, 140 Federal Street, Boston 10, Mass.

A.O.A. DIVISIONS AND COMMITTEES

ONE of the principal functions of the American Ordnance Association is "to provide, when required, the services of competent committees to investigate and report upon special ordnance subjects and to encourage programs for the adequate understanding of the procurement, production, and other untold phases of national preparedness including those new developments of logistics necessitated by modern military strategy and tactics."

To meet this obligation to our national defense, the Association has in operation a number of national divisions under the leadership of civilian experts who are well qualified to direct their activities. In addition, there are a number of committees on special subjects, some of which are of a continuing nature. Others for the performance of a specific undertaking are noncontinuing. All are devoted primarily to the advancement of engineering practices and production techniques relating to particular fields of ordnance.

Section 25 of the Association's by-laws provides that: "Each Division shall be under the direction of a committee to be selected by the Board of Directors. Through meetings, conferences, and discussions, and in coöperation with local Posts, they shall keep the membership in close contact with ordnance programs in particular fields. They shall meet as Divisions from time to time and shall be available in an advisory capacity for such matters as may be presented for their study and report either by the armed forces or by the Association."

Following are the personnel of the various Divisions, committees, and subcommittees that have thus far been activated.

ARTILLERY DIVISION

Executive Committee: J. E. Trainer, Firestone Tire & Rubber Company, Akron, Ohio, *chairman;* J. L. Auer, R. Hoe & Company, New York, N. Y.; John T. Brown, Chain Belt Company, Milwaukee, Wis.; Trevor Davidson, Bucyrus-Erie Company, South Milwaukee, Wis.; E. S. Dulin, Byron Jackson Company, Los Angeles, Calif.; W. J. Fisher, A. B. Farquhar Company, York, Pa.; L. Iverson, Mesta Machine Company, West Homestead, Pa.; N. R. Knox, Bucyrus-Erie Company, South Milwaukee, Wis.; E. R. Leeder, F. L. Jacobs Company, Detroit, Michigan; E. G. Williams, American Type Founders, Inc., Elizabeth, N. J.; W. H. Mitchell, Ridgewood Steel Company, Cincinnati, Ohio; Robert I. Martin, United Shoe Machinery Company, Beverly, Mass.; L. A. Petersen, Otis Elevator Company, New York, N. Y.; V. W. Peterson, Hannifin Manufacturing Company, Chicago, Ill.; S. E. Skinner, General Motors Corporation, Lansing, Mich.; C. W. Wright, Pullman-Standard Car Manufacturing Company, Washington, D. C.

FIRE CONTROL INSTRUMENT DIVISION

Executive Committee: Stanley C. Hope, Gilbert & Barker Manufacturing Company, West Springfield, Mass., *chairman;* J. A. MacDonnell, Gilbert & Barker Manufacturing Company, West Springfield, Mass., *secretary;* R. E. Gillmor, Sperry Gyroscope Company, New York, N. Y.; R. L. Goetzenberger, Brown Instrument Company, Philadelphia, Pa.; Myron Hayes, Eastman Kodak Company, Rochester, N. Y.; F. R. Lack, Western Electric Company, New York, N. Y.; J. T. Mackey, Mergenthaler Linotype Company, Brooklyn, N. Y.; Harold W. Sweatt, Minneapolis-Honeywell Regulator Company, Minneapolis, Minn.; Gordon B. Welch, Linotone Corporation, New York, N. Y.

GAGE INDUSTRY DIVISION

Executive Committee: Louis Polk, Sheffield Corporation, Dayton, Ohio, *chairman;* Erik Aldeborgh, Standard Gage Company, Poughkeepsie, N. Y.; Edward H. Cahill, Haverford, Pa.; J. Chester Bath, John Bath & Company, Worcester, Mass.; F. S. Blackall, Jr., Taft-Peirce Manufacturing Company, Woonsocket, R. I.; E. J. Bryant, Greenfield Tap and Die Corporation, Greenfield, Mass.; E. B. Gallaher, Clover Manufacturing Company, Norwalk, Conn.; Harry B. Hambleton, Brielle, N. J.; Charles M. Pond, Pratt & Whitney, West Hartford, Conn.; Ray W. Rice, Quality Tool and Die Company, Indianapolis, Ind.; F. C. Tanner, Federal Products Corporation, Providence, R. I.; B. B. Patton, Frankford Arsenal, Philadelphia, Pa.; Gene W. Gray, Frankford Arsenal, Philadelphia, Pa. (*alternate*); W. P. Henry, Navy Bureau of Ordnance, Washington, D. C.; A. D. Anderson, Navy Bureau of Ordnance, Washington, D. C. (*alternate*); Arthur F. Wentzel, Engineering Standards Branch, Hq. AMC, Wright Field, Dayton, Ohio; R. F. Bosron, Inspection Section, Procurement Division, Wright Field, Dayton, Ohio (*alternate*).

ROCKET, BOMB, AND ARTILLERY AMMUNITION DIVISION

Executive Board: Harvey C. Knowles, Procter & Gamble Company, Cincinnati, Ohio, *chairman;* J. A. Meek, Firestone Tire & Rubber Company, Akron, Ohio, *deputy chairman;* R. H. Kellogg, Procter & Gamble Company, Cincinnati, Ohio, *secretary.*

Rocket and Shell Committee: W. N. Howley, Lansdowne Steel & Iron Company, Morton, Pa., *chairman.*

Cartridge Case Committee: K. T. Norris, Norris Stamping and Manufacturing Company, Los Angeles, Calif., *chairman;* W. L. Chandler, Fulton Sylphon Company, Knoxville, Tenn.; Weber deVore, Heintz Manufacturing Company, Philadelphia, Pa.; William J. Gazey, Ekco Products Company, Chicago, Ill.; Frank German, Plume & Atwood Manufacturing Company, Thomaston, Conn.; H. M. Heckathorn, Mullins Manufacturing Corp., Salem, Ohio; A. C. Kieckhafer, West Bend Aluminum Company, West Bend, Wis.; W. H. Miller, Bossert Company, Utica, N. Y.; C. L. Patterson, Electric Auto-Lite Company, Cincinnati, Ohio; N. H. Preble, Detroit Harvester Company, Detroit, Mich.; M. L. Sperry, Jr., Scovill Manufacturing Company, Waterbury, Conn.; H. W. Steinkraus, Bridgeport Brass Company, Bridgeport, Conn.; H. B. Stoner, Stoner Manufacturing Corporation, Aurora, Ill.; J. A. Watson, Motor Wheel Corporation, Lansing, Mich.

Material Subcommittee: Dr. Anson Hayes, American Rolling

A.O.A. DIVISIONS AND COMMITTEES

Mill Company, Middletown, Ohio; Kirby F. Thornton, Aluminum Company of America, Westmoreland, Pa.; H. C. Larson, Bethlehem Steel Company, Bethlehem, Pa.

Technical Subcommittee: Harry M. Day, Ekco Products Company, Chicago, Ill.; E. M. Wagner, San Marino, Calif.

Powder and Explosives Committee: J. M. Skilling, Military Explosives Division, E. I. du Pont de Nemours & Company, Wilmington, Del., and Henry N. Marsh, Hercules Powder Company, Wilmington, Del., *cochairmen;* R. C. Burton, Tennessee Eastman Corporation, Kingsport, Tenn.; L. B. Fraser, Fraser-Brace Engineering Company, New York, N. Y.; C. M. Jenkins, Spencer Chemical Company, Washington, D. C.; Dr. C. R. McCullough, Monsanto Chemical Company, Oak Ridge, Tenn.; J. J. McIntire, Trojan Powder Company, Allentown, Pa.; F. Olsen, Western Cartridge Division, Olin Industries, Inc., East Alton, Ill.; F. S. Pollock, Atlas Powder Company, Wilmington, Del.; A. F. Weimann, United States Rubber Company, New York, N. Y.

Container Committee: Gerard W. Mulder, Cleveland Container Company, Cleveland, Ohio, *chairman;* J. F. Griswold, Jr., Chicago Mill & Lumber Company, Chicago, Ill.; H. Holbrook, Standard Cap & Seal Company, New York, N. Y.; William Mayers, Industrial Tape Corporation, Milltown, N. J.; John Wiebers, American Can Company, Chicago, Ill.

Bomb Committee: R. Furrer, American Car and Foundry Company, New York, N. Y., *chairman.*

Fuze Committee: J. E. Burke, Stewart-Warner Corporation, Chicago, Ill., *chairman;* Edward A. Ash, F. L. Jacobs Company, Detroit, Mich.; Chester Burnett, Scovill Manufacturing Company, Waterbury, Conn.; W. F. Errig, Peco Manufacturing Corporation, Philadelphia, Pa.; T. B. Gibbs, Gibbs Manufacturing & Research Corporation, Janesville, Wis.

Loading Committee: M. P. Woodward, Procter & Gamble Company, Cincinnati, Ohio, *chairman;* C. B. Burnett, Johns-Manville Products Corporation, New York, N. Y.; B. B. Bond, Remington Rand, Inc., Stamford, Conn.; Harold R. Child, Goodyear Tire & Rubber Company, Akron, Ohio; Harold C. Hoch, Goodyear Tire & Rubber Company, Akron, Ohio (*alternate*); J. A. Kelly, Todd & Brown, Inc., New York, N. Y.; L. M. Freeman, B. F. Goodrich Company, Akron, Ohio; R. W. Johnson, American Swiss Company, Toledo, Ohio.

SMALL ARMS AND SMALL ARMS AMMUNITION DIVISION

Executive Board: C. K. Davis, Remington Arms Company, Bridgeport, Conn., *chairman;* F. F. Hickey, Savage Arms Corporation, Utica, N. Y., *deputy chairman;* Col. Wallace L. Clay, Remington Arms Company, Inc., Bridgeport, Conn., *secretary;* Graham H. Anthony, Colt's Manufacturing Company, Hartford, Conn.; E. S. Burke, Kelly-Springfield Tire Company, Cumberland, Md.; Ward M. Canaday, Willys-Overland Motors, Inc., Toledo, Ohio; C. Stewart Comeaux, Sporting Arms and Ammunition Manufacturers' Institute, New York, N. Y.; C. Donald Dallas, Revere Copper and Brass, Inc., New York, N. Y.; Arthur G. Drefs, McQuay-Norris Manufacturing Company, St. Louis, Mo.; C. L. Horn, Federal Cartridge Company, Minneapolis, Minn.; O. E. Hunt, General Motors Corporation, Detroit, Mich.; J. W. McGovern, United States Rubber Company, New York, N. Y.; John M. Olin, Olin Industries, Inc., East Alton, Ill.; Philip D. Wagoner, Underwood Corporation, New York, N. Y.; Thomas J. Watson, International Business Machines Corporation, New York, N. Y.

Rifles and Carbines Committee: Edwin Pugsley, Winchester Repeating Arms Company, New Haven, Conn., *chairman;* A. Edward Allen, Utica Cutlery Company; H. A. Brown, Remington Arms Company; J. S. Nicholas, Union Fork & Hoe Company; John O'Brien, Inland Manufacturing Division, GMC; James G. Johnston, International Business Machines Corporation; F. R. Valpey, Standard Products Company; J. C. Garand, Springfield Armory, *consultant.*

Machine Guns, Belts, Links Committee: G. A. Wilson, High Standard Manufacturing Company, New Haven, Conn., *chairman;* George Webb, Colt's Manufacturing Company; F. H. Groesbeck, Savage Arms Corporation; G. S. Cole, Jr., Brown-Lipe-Chapin Division, GMC; W. J. Foster, AC Spark Plug Division, GMC; James W. Pattison, Kelsey-Hayes Wheel Corporation; S. G. Green, Ordnance Department, *consultant.*

Small Arms Ammunition Committee: E. C. Hadley, Remington Arms Company, Bridgeport, Conn., *chairman;* Robert B. Ehlen, Federal Cartridge Company; George L. Dawson, Western Cartridge Company; A. J. Mummert, McQuay-Norris Manufacturing Company; C. L. Wanamaker, U. S. Rubber Company; F. J. Jervey and G. A. Miller, Ordnance Department (alternate), *consultants.*

Pistols and Revolvers Committee: George Webb, Colt's Manufacturing Company, Hartford, Conn., *chairman;* M. J. Day, Carnegie-Illinois Steel Corporation; H. H. Murtha, High Standard Manufacturing Company; G. E. Bauder, Remington Rand, Inc.; H. E. Howland, Ithaca Gun Company; C. R. Hellstrom, Smith & Wesson Company; E. W. Hopkins, Springfield Armory, *consultant.*

MACHINE TOOL COMMITTEE

Walter Tangeman, Cincinnati Milling Machine Company, Cincinnati, Ohio, *chairman;* Herbert H. Pease, New Britain Machine Company, New Britain, Conn.; A. H. Eggers, Greenlee Brothers & Company, Rockford, Ill.; Haviland Wright, Wright & Gade Tool Company, Philadelphia, Pa.; Richard E. LeBlond, R. K. LeBlond Machine Tool Company, Cincinnati, Ohio; Richard A. Heald, Heald Machine Company, Worcester, Mass.; George H. Johnson, Gisholt Machine Company, Madison, Wis.

¶ The technical and scientific sessions of the Thirtieth National Meeting of the American Ordnance Association will be held at the Book-Cadillac Hotel, Detroit, Mich., Wednesday, June 9, 1948. All members of the Association have been invited to attend.

¶ This session will include a summary of the present activities of Divisions and Committees supplemented by several technical papers by representatives of some of the leading industrial organizations of the United States now conducting research and development. Following this session there will be an opportunity to inspect research activities in the Detroit area.

They're rolling high along the levee

Though they're the younger members of a famous line of earthmoving equipment, "Caterpillar" Scrapers, Bulldozers, Wagons and wheel-type Tractors are fully living up to the performance their long planning and careful manufacture have made possible.

In the pictures you see them starring on a levee operation, supervised by U. S. Army Corps of Engineers, that affords an excellent pilot study of equipment for other types of earthmoving projects as well. Location: near Granite City, Ill.

Here "Caterpillar" DW10 Tractors pull No. 10 Scrapers and speed them to destination at 18 m.p.h. Ten trips per hour on an 1800-ft. haul prove their fast "get-there-and-back." From dragline loadings they pull W10 Wagons with the same high efficiency. A typical example of matched-equipment teamwork in the most modern manner!

"Caterpillar" dealers have all the facts—about the features and high promise of these sturdy, clean-cut, capable machines.

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

CATERPILLAR
REG. U. S. PAT. OFF.
DIESEL ENGINES • TRACTORS
MOTOR GRADERS
EARTHMOVING EQUIPMENT

Announcing

NISILOY

A NEW INOCULANT THAT

IMPROVES MACHINABILITY AND GRAIN STRUCTURE OF

GRAY IRON CASTINGS

Here's your copy . . . a booklet containing full information about one of the most useful products ever offered for improving machinability and structure of gray iron castings. It's yours on request . . . mail the coupon now.

THE INTERNATIONAL NICKEL COMPANY, INC.
Dept. AO, 67 Wall Street, New York 7, N. Y.

Please send me your booklet entitled,
"NISILOY" for GRAY IRON CASTINGS.

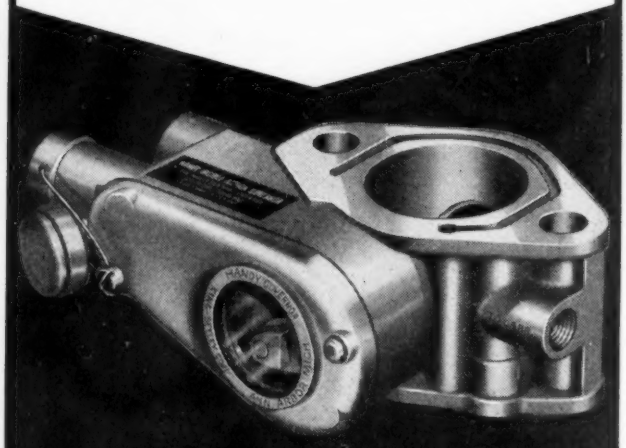
Name.....*Title*.....
Company.....
Address.....
City.....*State*.....

EMBLEM OF INCO SERVICE
TRADE MARK

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N.Y.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

the governor that
assures economy
of automotive
vehicle operation



The Handy Vari-Speed Governor used on many well-managed truck fleets over a period of years has proved its outstanding value in preventing costly operating practices.

A poll of 180 such fleets shows actual savings as follows:

General maintenance	26%
Engine repair	32%
Tire maintenance	22.6%
Insurance	16%
Lubrication	26%
Fuel	13.5%
Brake maintenance	29.2%
Accidents	37%

Other King-Seeley automotive instruments with long successful service records include:

- Telegages—Fuel level, oil pressure and water temperature
- Ammeters • Speedometers

Specify KS control instruments for greatest effectiveness and economy of automotive operation.

KING-SEELEY CORPORATION
ANN ARBOR MICHIGAN
PLANTS IN
ANN ARBOR • GRAND RAPIDS • YPSILANTI

New Developments

GROUND

MASTER RESEARCH PLAN

To keep the United States ahead in the weapons race, the Research and Development Board has been ordered by James Forrestal, Secretary of Defense, to submit at least once a year a new master plan for military research. The instructions appeared in a directive defining the duties and authority of the board, the membership of which was completed recently under the chairmanship of Dr. Vannevar Bush. On the board are two representatives each of the Army, Navy, and Air Force.

"OPERATION WINDCHILL"

Army Medical Department researchers have undertaken exhaustive experiments, with the coöperation of the U. S. Air Force, to determine, through "Operation Windchill," what might happen to the physical and psychological well-being of soldiers suddenly transported by air from warm climates to extreme Arctic cold.

Thirty-two Air Force soldiers, selected for high physical and mental capacity from a group of volunteers, were stationed at a Florida post for months and were completely adjusted to the climatic conditions. In less than a day they were set down amid snow and ice in zero temperatures to set up a bivouac—a situation similar to what would be encountered had they crashed in the Arctic.

The object of the Army Medical Department is to determine exactly what changes take place in the bodies of these men in the course of adjustment to extreme cold by subjecting them to about every physical test known to medical science.

21-TON BOMB DROPPED

A bomb almost twice the size of the largest previously dropped from an airplane has been test-dropped for the Army Ordnance Department by the Air Force at Muroc Air Force Base, Calif. The bomb, weighing 42,000 pounds, was dropped from a Boeing B-29 Superfortress. The largest bomb previously dropped weighed 25,000 pounds.

The purposes of the joint test operation were to obtain flight data on the path of the bomb after its release to enable Ordnance engineers to perfect the bomb's design and to determine the effect on a plane suddenly lightened by 42,000 pounds.

The bomb has a body diameter of 4½ feet and an over-all length of 26 feet, 10 inches, with fins installed. It was designed by the Ordnance Department for the Air Force early in 1945, but the first bombs were not completed until after World War II had ended. Known as a general-purpose bomb, it was intended for use against heavily armored enemy installations. While lacking the destructive power of atomic missiles, the 42,000-pound bomb has an advantage in that it leaves no radioactivity which might deny use of a captured area to the attacking force.

LENSES FOR RADIO

An entirely new type of metal lens for focusing radio waves in radio relay systems is under development at Bell Telephone Laboratories. Present plans call for the use of the lens—theoretically capable of handling from fifty to one hundred television channels or tens of thousands of simultaneous telephone messages—in the proposed radio relay link which the Bell Sys-

EVERY FOURTH PART IS A BONUS PART

That's the "NEW ARITHMETIC IN STEEL"

3 TONS > 4 TONS

N-A-X HIGH-TENSILE CARBON SHEET STEEL

MAKE A TON OF SHEET STEEL GO FARTHER

Specify—

N-A-X

HIGH-TENSILE STEEL

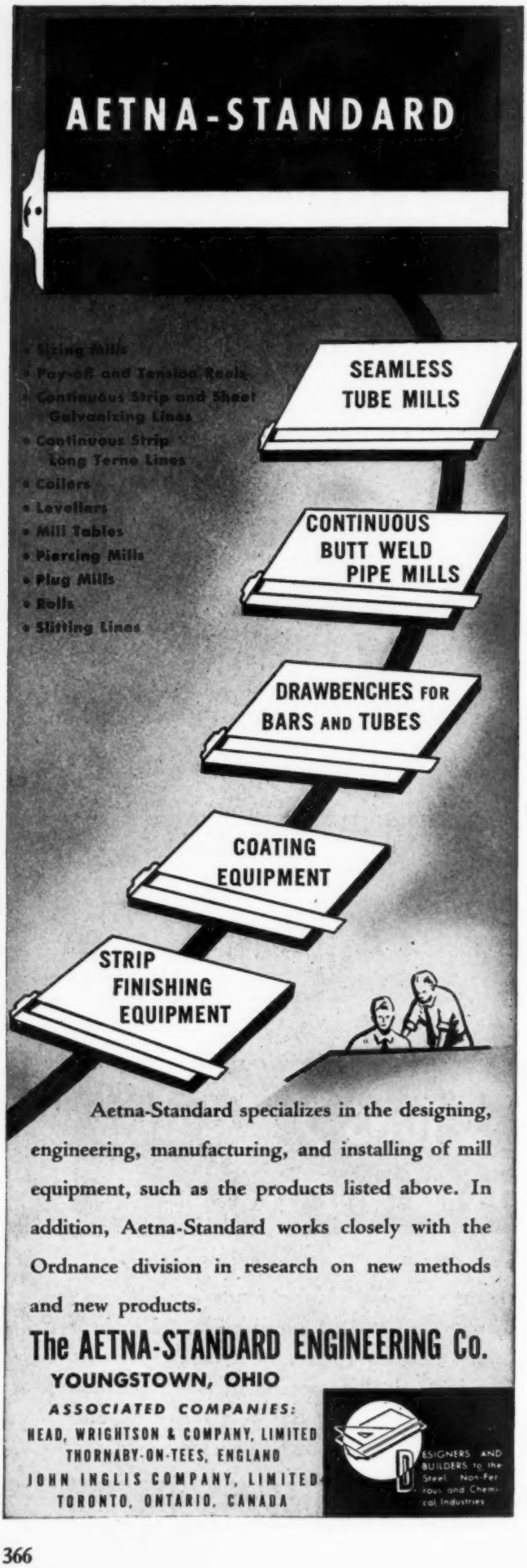
Each ton of **N-A-X HIGH-TENSILE** can be made to produce up to 33% more parts. Its greater strength and corrosion resistance permits lighter sections. The saving in steel is translated into "bonus" parts—as much as one extra part for every three you now produce.

GREAT LAKES STEEL CORPORATION

N-A-X ALLOY DIVISION • DETROIT 18, MICHIGAN

UNIT OF NATIONAL STEEL CORPORATION

PYRIGHT 1948 GREAT LAKES STEEL CORP.


AETNA-STANDARD
• Sizing Mills
• Pay-off and Tension Reels
• Continuous Strip and Sheet Galvanizing Lines
• Continuous Strip Long Terne Lines
• Coilers
• Levellers
• Mill Tables
• Piercing Mills
• Plug Mills
• Rolls
• Slitting Lines
SEAMLESS TUBE MILLS
CONTINUOUS BUTT WELD PIPE MILLS
DRAWBENCHES FOR BARS AND TUBES
COATING EQUIPMENT
STRIP FINISHING EQUIPMENT
Aetna-Standard specializes in the designing, engineering, manufacturing, and installing of mill equipment, such as the products listed above. In addition, Aetna-Standard works closely with the Ordnance division in research on new methods and new products.
The AETNA-STANDARD ENGINEERING Co.
YOUNGSTOWN, OHIO
ASSOCIATED COMPANIES:
HEAD, WRIGHTSON & COMPANY, LIMITED
THORNABY-ON-TEES, ENGLAND
JOHN INGLIS COMPANY, LIMITED
TORONTO, ONTARIO, CANADA
DESIGNERS AND BUILDERS to the Steel, Non-Ferrous and Chemical Industries

New Developments

tem is planning between New York, N. Y., and Chicago, Ill.

The new lenses are based on the theories of light transmission through atomic and molecular structures and use metallic spheres, disks, or strips in a scaled-up pattern similar to the arrangement of atoms in a crystalline molecule.

HYDROPONIC GARDENS

Fresh vegetables for use with Army rations in overseas installations where they cannot otherwise be supplied are being produced successfully and in large quantities by the employment of hydroponic gardening. The hydroponic garden method, also known as nutriculture, water culture, and chemiculture, consists of beds of gravel, stones, cinders, or other inert materials in which vegetables are grown by supplying them with water and the nutrient chemicals necessary for their growth.

REORGANIZATION

The entire organization of what was once the Aircraft Research and Development Division, Willys-Overland Motors, Inc., which included a group of specialists in the field of guided missiles and pilotless aircraft, has recently become the Research and Development Division, General Tire & Rubber Company, of California. Dr. Norton B. Moore is director and J. H. Talley is division manager.

NEW ELECTRONIC DISCOVERY

A radically new method of controlling the flow and amplification of electric current—one that may have far-reaching influence on the future of electronics—has been discovered at Bell Telephone Laboratories. The method is based on the discovery that when beams of electrons are shot at an insulator—in this case a diamond chip—electric currents are produced in the insulator which may be several hundred times as large as the current in the original electron beam. The technique holds promise, after engineering development, of opening up an entirely new approach to the design and use of certain types of electron tubes.

RADAR CHARTS BULLET COURSE

New advances in radar make it possible to chart the speed of a bullet while it is still in the barrel of a gun. These advances also make it possible for soldiers in the field to detect the location of artillery firing on them and to pick out a moving tank from the clutter of other motionless objects on the radar screen. The new equipment can discover moving troops and is light enough to be carried in the field by soldiers.

COLD-RESISTANT RUBBER

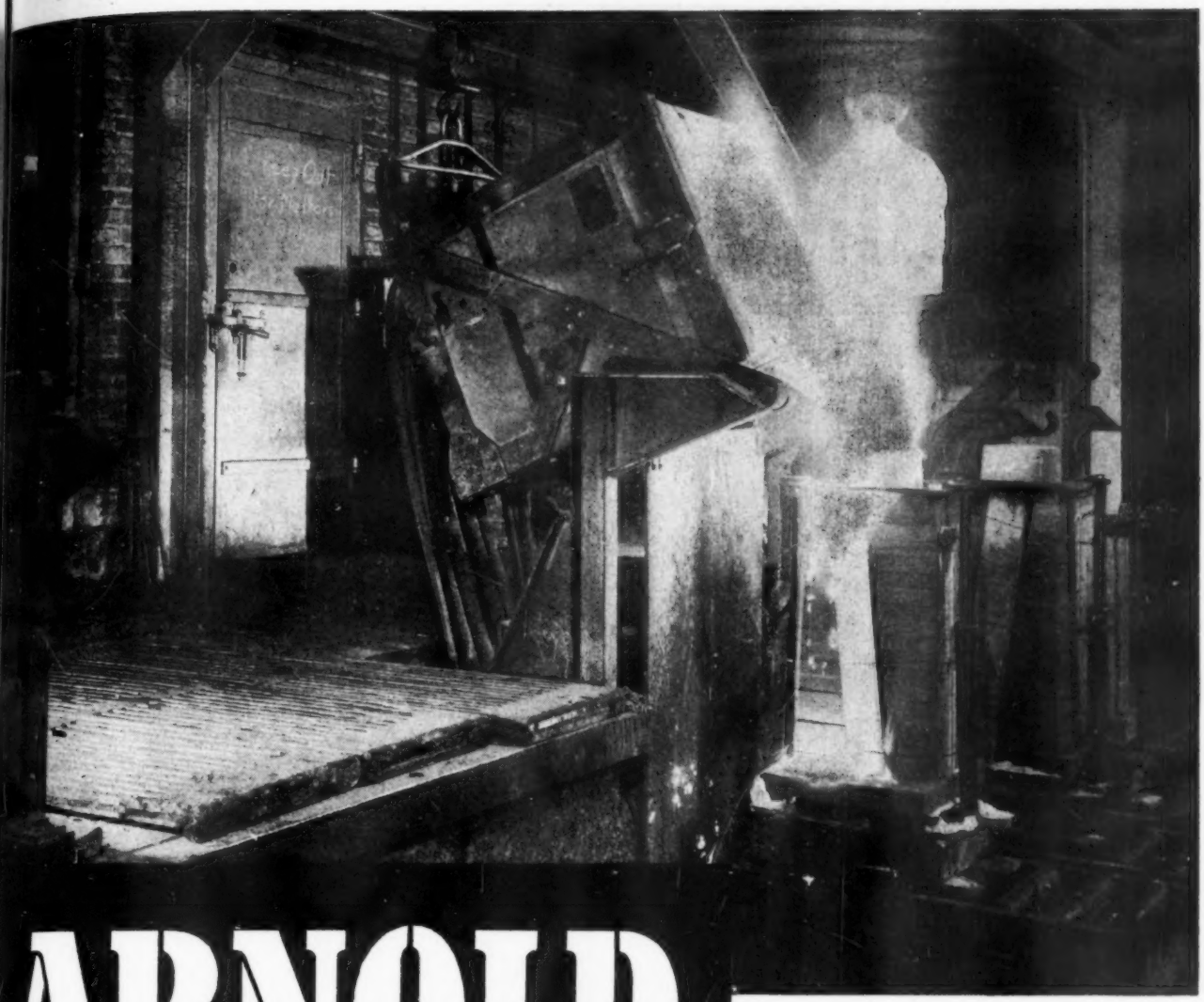
The Office of the Chief of Engineers has recently established a project for the development of new types of synthetic rubber which will resist the effects of extreme cold and will retain all the desirable characteristics of synthetic and natural rubbers.

Consideration will be given to polybutadienes, polysulphide rubbers, polyisobutylene, polyamides, polyester, isocyanates, silicones, fluorocarbons, Neoprene F R, and others. Compounding research will be conducted in the Engineer Research and Development Laboratories to develop the elastomers into compounds which will meet the equipment requirements of the Corps of Engineers.

SEA

NEW ROCKET HITS 3,000 M.P.H.

A new Navy rocket, the Aerobee, has spurted 78 miles into the sky and hit a speed of 3,000 miles an hour. This is the highest and fastest an American missile has gone. The wartime



ARNOLD PERMANENT MAGNETS

100% quality-controlled at every step from the design board to final assembly

The increased efficiency and economy you'll realize in the use of Arnold Permanent Magnets are *constant* factors. The thousandth unit is exactly like the first—because they're produced under controlled conditions at every step of manufacture, to bring you complete uniformity in every magnetic and physical characteristic. Count on Arnold Products to do your magnet job *best*—and they're available in any grade of material, size, shape, or degree of finish you require. Write us direct, or check with any Allegheny Ludlum field representative.

W&D 1297

THE ARNOLD ENGINEERING CO.

Subsidiary of
ALLEGHENY LUDLUM STEEL CORPORATION
147 East Ontario Street, Chicago 11, Illinois

Specialists and Leaders in the Design, Engineering and Manufacture of PERMANENT MAGNETS

METALWORKING MACHINERY

Cold Headers for Bolts, Screws, etc.

Bolt Head Trimmers

Screw Thread Rolling Machines

Nut Forming Machines

Nut Tapping Machines

Screw Slotters

Rivet Drillers

Power Presses of all Kinds

Eyelet Machines

Small Arms Ammunition Machines

Collapsible Tube Machines

Thread Rolling Machines for Shells

Wire Drawing Machines

Rolling Mills for Sheets and Strips

Rod and Tube Mills

Flatteners and Straighteners

Gang Slitting Machines

Swagers, Pointers, Coilers, Winders, etc.

Special and Miscellaneous Machines

WATERBURY FARREL
FOUNDRY AND MACHINE COMPANY
Waterbury Connecticut, U. S. A.
SALES OFFICES:
CHICAGO CLEVELAND NEWARK, N. J.

New Developments

German V-2 reached 114 miles and about 3,500 miles an hour in tests at White Sands Proving Ground where this new rocket has just undergone its initial flight.

The Aerobee exceeded the performance of the Army's WAC Corporal and appears to be of a pencil-thin design as contrasted with the V-2. Developed under the supervision of the physics laboratory of Johns Hopkins University by the Aerojet Corporation and Douglas Aircraft Company, it carried 150 pounds of instruments for recording cosmic-ray activity in the upper atmosphere.

SUBMARINES STREAMLINED

The first of a series of basic steps toward the design and perfection of the true submarine consists of alterations to a number of fleet-type submarines to incorporate the results of recent Navy research and wartime German developments. The alterations being made to streamline the undersea craft include removal of deck guns and other topside equipment and apparatus and a reduction in the size of the superstructure.

As part of the same alteration program, an improved version of the "Schnorkel" breathing tube apparatus developed by the Germans is being installed.

PERISCOPE CAMERA

A new type of periscope camera for the U. S. Submarine Service was disclosed recently by Eastman Kodak Company. It is stated that the new camera can take close-up beachhead pictures at a speed of better than one per second. Kodak also reported that it has supplied the Navy's undersea force with a device by which a sheet of film from the new camera can be processed in daylight in less than sixty seconds.

The pictures it takes are about four inches square. They can be snapped in quick succession and pieced together to form a mosaic of a shoreline. This method often proves more suitable for beachhead planning than does the use of photos from fast-flying planes.

AIR TRANSPORTABLE DOCK

An air-transportable floating service dock for seaplanes has been developed by the Navy Bureau of Aëronautics. The portable dock, composed of nine pneumatic float sections connected in a "U" and covered with a plywood deck, is designed for use at advance bases where seaplane maintenance facilities are inadequate or nonexistent.

The entire unit, which weighs about 5,600 pounds, can be stowed aboard a Mariner Navy patrol bomber seaplane, flown to an advance base, and then assembled from the plane and towed to any desired position by the plane. It also may be disassembled from the water.

ROUGH-WATER AMPHIBIAN

Successful test flights from land and water have been made by the Navy's newest amphibian utility airplane, the XJR2F Albatross, a 4-purpose, twin-engine craft designed and manufactured by Grumman Aircraft Engineering Corporation. The new plane is designed for rough-water operation on the open sea, in rescue work, personnel or cargo transport, or multi-engine seaplane training. It is the product of extensive hydrodynamic research and incorporates more freedom from "porpoising" and instability on rough water than any Navy plane so far perfected. It is expected to operate in waves as high as 4½ feet.

MECHANICAL BRAIN

A second huge electrical calculating machine, capable of solving some of the most complex mathematical problems, has been built for the Navy and is being set up at the Naval Proving Ground at Dahlgren, Va. Primary use of the new 25-ton

Common sense suggests it..

-experience proves it..

the best brake is AIR

The logic of installing the safest possible brakes on a vehicle is indisputable—and that means Bendix-Westinghouse Air Brakes, of course. But when you back up that logic with the dollar and cents fact that the extra protection *pays for itself* in a short time, you have an investment too good to pass up. Vehicles carry heavier payloads safely, travel on faster schedules, drivers are better satisfied, and service costs lower—all because of Air Brakes. Check with your Bendix-Westinghouse Distributor. He'll show you why the best brake is AIR.

BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY, ELYRIA, OHIO

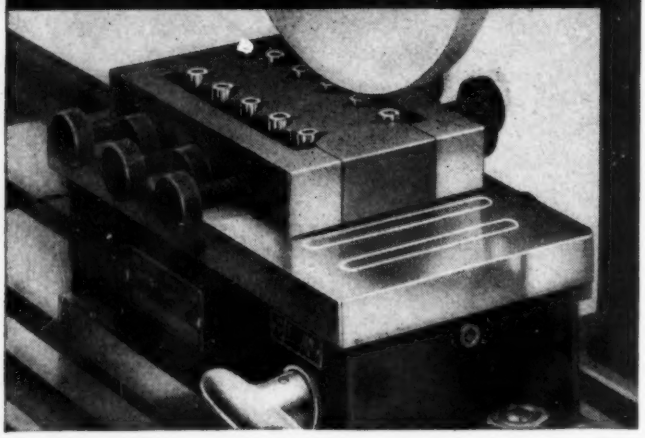
BENDIX-WESTINGHOUSE AIR BRAKES TRADE MARK REGISTERED

the best AIR brake is

Bendix-Westinghouse

4 NEW ADDITIONS

to the BROWN & SHARPE LINE of PERMANENT MAGNET CHUCKS

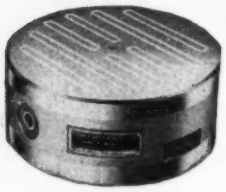


1 No. 408 Rectangular Model grinding bushing ends. Working surface, 4" x 8". Pole spacers, closer than on other rectangular models, hold smaller pieces.

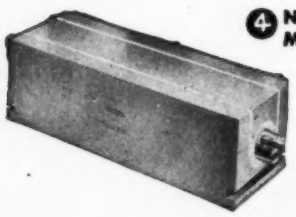
New Small Sizes . . . New Features

These new models have all the advantages of other B & S Permanent Magnet Chucks . . . ready portability, absence of wires and auxiliary generators, freedom from heating with attendant distortion of work, strong holding power-retained indefinitely. All, suitable for wet and dry grinding. For sale only in the United States of America and its Territories. For complete information write Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

2 No. 5R Rotary Model, is the smallest B & S rotary model. Holds work from ¾" to 5" in diam. Control ring permits control of holding strength from any position in which chuck stops.



3 No. 7R Rotary Model, next smallest rotary model, holds work from 1 3/16" to 7" in diam. The amount of energy or holding power in the face can be controlled by giving the operating handle a part turn, thus permitting work to be moved or tapped into position and centered accurately.



4 No. 412 Two-Line Rectangular Model, has working surface, 4" x 12" and two line spacers. Useful for grinding rows of small parts as well as intermediate and large sizes. Many types of work may be laid end-to-end over line spacers. Packing strips not required.

We urge buying through the Distributor

BROWN & SHARPE B·S

New Developments

machine will be to produce range tables for new-design missiles of various types as well as to make computations in connection with guided missiles for the Navy's Bureau of Ordnance.

The mechanical brain, known technically as the "Aiken Relay Calculator," was designed and built under the direction of Prof. Howard H. Aiken at the Harvard University.

AIR

JET FIGHTER TRAINING

In preparation for its future goal of an all-jet tactical air force, the Air Force has announced that by October 1948 all student pilots will be getting jet fighter training.

Testing the new streamlined flight training program, twenty selected students at Williams Field, Ariz., are in the process of receiving twenty hours' instruction on jet-propelled P-80's before graduating as pilots.

Initially, the students were given eighty hours of single-engine advanced training using conventional reciprocating-engine fighter aircraft. The P-80 instruction includes flying characteristics and familiarization with jet aircraft, navigation, formation, and altitude training.

"OUTDOOR WIND TUNNEL"

In experiments to determine the feasibility of an "outdoor wind tunnel" the Northrup Aviation Company has sent sled-type vehicles roaring along rail tracks at the speed of 1,019 m.p.h.

The tests conducted at the sprawling Muroc Air Base were made with rocket-powered sleds operating on special runners on standard-gauge railroad track. The pilotless vehicles covered the special 2,000-foot test track in less than two seconds and hurtled on across the desert after they left the track at the far end. The sled is fifteen feet long and is constructed of aluminum alloy.

Main purpose of the test was to determine the practicability of testing advanced airfoils at transsonic and supersonic speeds. In manmade wind tunnels the air is forced artificially and sometimes distortedly past a suspended model. If the "outdoor tunnel" proves practical the research model would be rammed through free air at supersonic speeds.

NEW JET FIGHTER TEST

The U. S. Air Force's newest long-range 2-place fighter and the first ever powered by four jet engines, the Curtiss XP-87, has successfully completed its first test flight at the Muroc Air Base.

Designed to operate in the 600-mile-an-hour range, the XP-87 has a gross weight almost as much as the Boeing B-17 Flying Fortress and is one of the largest fighter planes ever produced. It has a wing span of approximately sixty feet and an over-all length of approximately sixty-five feet.

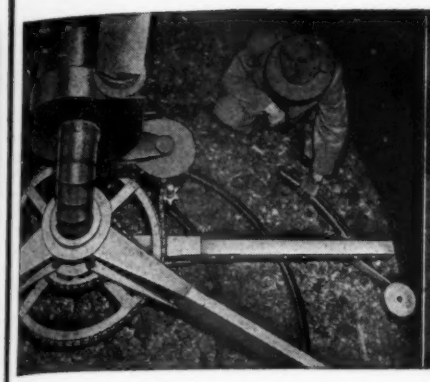
WEATHER DATA FOR JET PILOTS

A new system of radiotelephone communication which permits direct conversation between weather forecasters and pilots has been inaugurated by Air Weather Service to furnish faster weather advice to high-speed jet aircraft of the U. S. Air Force. The system is being installed to meet problems created by the rapid fuel consumption and high speeds of jet planes.

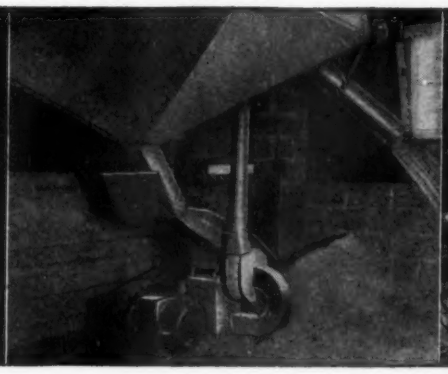
Properly timed weather briefing is of critical importance to the jet pilot, and knowledge of the weather situation which will exist at the destination at the exact time of arrival is vital. Due to fuel consumption of such aircraft at low altitudes, once a jet pilot has "let down" to land after a long flight there might be insufficient fuel remaining to proceed to an alternate base some distance away.

IT'S A "PUSH-BUTTON" FARM AGE IN NORTHERN ILLINOIS

With electricity available to 96 per cent of its farms, Northern Illinois is pioneering and developing many progressive farming methods. Close cooperation of our trained agricultural engineers with manufacturers, farm organizations and farmers themselves has resulted in numerous labor-saving innovations which are increasing production and making the farmer's job easier. Below are a few of these developments.



***SILO UNLOADING** is a snap with this automatic unloader which claws the silage loose, then blows it down to a feed cart below while the farmer is doing another chore. Saves five days of work a month on many farms!*



***FEED GRINDING AND MIXING** for cattle, sheep and poultry is another "push-button" job. With grinder, mixer and well-placed chutes and bins, you just put in the right ingredients, and flick the switch . . . the job's done.*

***EGG PRODUCTION** is up, with time-controlled lighting, water warmers, and poultry-house ventilators. These aids all contribute to increased egg volume in the fall and early winter when prices are highest.*

***WATER** when and where needed, and in the right amounts, is provided by "push-button" irrigation. Overhead, open ditch, or lightweight on-the-ground pipe systems make truck gardeners independent of the weatherman.*

***HAY DRYING SYSTEMS** permit speedy mowing away of leafy, green, high-moisture and vitamin content hay . . . the kind that produces more milk. It is efficiently dehydrated by air forced through ducts in the mow.*

***PORK PRODUCTION PROFITS** begin at farrowing time! Electric pig-brooders help more pigs reach weaning age . . . help decrease the 33⅓ per cent pig mortality rate, and send more pork to markets for sale and profit.*

Forty per cent of America's farm output, in dollar value, is produced in—or within an overnight ride of—Northern Illinois. Chicago has become the hub of the world's greatest packing and food storage industry, as well as the largest single live animal market. Because the Middle West is the nation's granary, Chicago and Northern Illinois is a huge grain distributing center. As focal point for the nation's transportation network, the food wealth of the fertile upper Mississippi prairies and livestock from the western ranges flow into this area. Agriculture and industry are partners in Chicago and Northern Illinois.

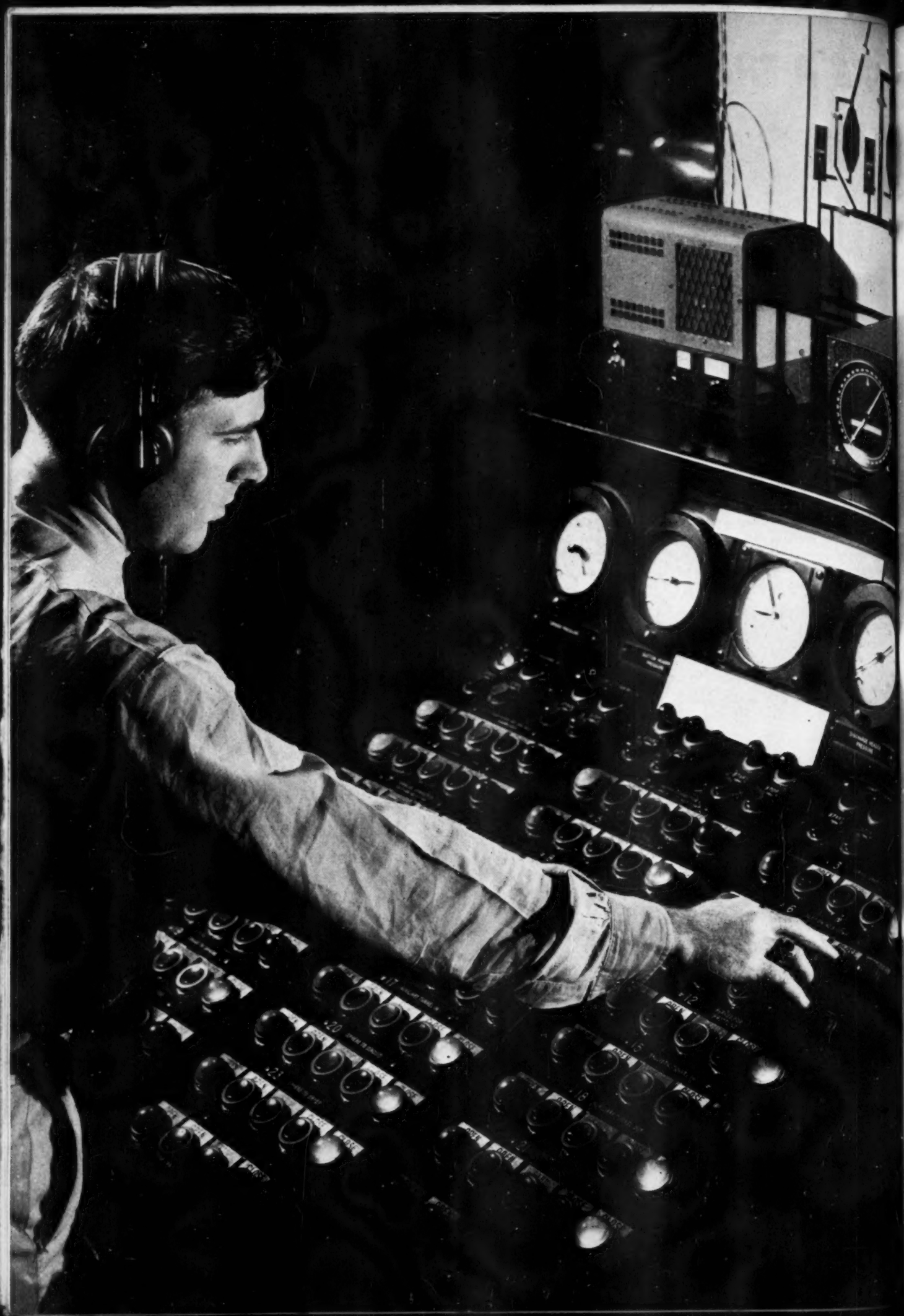
This is one of a series of advertisements on the industrial, agricultural and residential characteristics of Chicago and Northern Illinois

TERRITORIAL INFORMATION DEPARTMENT

Marquette Building—140 South Dearborn Street, Chicago 3, Illinois—Phone RANdolph 1617

COMMONWEALTH EDISON COMPANY • PUBLIC SERVICE COMPANY OF NORTHERN ILLINOIS

WESTERN UNITED GAS AND ELECTRIC COMPANY • ILLINOIS NORTHERN UTILITIES COMPANY



Strategy in the Atomic Age

The New Chief of Staff's Formula For World Peace

GENERAL BRADLEY speaks softly but carries a big stick.

Modest and unassuming, he is rarely the focus of public attention. He issues no spectacular statements to the press, strikes no poses, avoids controversy, threatens no one.

Yet he symbolizes America's might at its best and finest, in all its powerful facets—integrity, courage, vision, experience, leadership, demonstrated ability, passion for justice, love of peace.

Our Nation, and the free nations of the world which have thus far remained outside the Iron Curtain, are most fortunate in this respect: the world's greatest bulwark of peace on earth—the United States Army—has as its top commander Omar Nelson Bradley.

The Bradley philosophy is a homespun composite of hardheaded realism and genuine American idealism. While recognizing full well the awful gravity of the present hour, he has by no means abandoned the quest for peace.

"Our only certainty of survival in this atomic world," he says, "is not to sit with a sword in hand but to eliminate war and the causes of war."

One of the startling tragedies of our day is that the nation most passionately desirous of peace should be, because of its unrivaled industrial power, a first-priority target in the event of world aggression.

The American people are compelled, by the logic of grim circumstances, to increase their armed power as a deterrent to those who today are manifesting a less passionate devotion to peace and a less plausible conviction in justice.

There is no security either in weakness or excessive arms. Excessive military preparedness can precipitate war almost as readily as excessive weakness.

"Military preparedness," General Bradley says, "should never exceed the minimum requirements necessary to give a reasonable assurance of national security. Overwhelming armies and navies can be maintained only at the cost of human welfare."

Military preparedness must be accompanied by industrial preparedness.

"In everyday terms," General Bradley says, "industrial preparedness would set up an additional guarantee against war. From a psychological standpoint, it would serve full notice that American industry has not surrendered its responsibility for national defense in a reckless reversion to business as usual. It will show that business is on guard and ready to produce even more and better equipment than it did in World War II—and that it is prepared to do it more quickly. Industrial planning means that the greater our capacity to turn out weapons, the fewer soldiers we shall need in war or in peace."

HERE is General Bradley's advice on how we can discharge this peacetime rôle:

1. Apply realism and intelligence to our new world position;
2. Continue our efforts to seek a settlement of world disputes through justice rather than force;
3. Devote a portion of our earnings, time, and effort to national defense.
4. Cherish freedom and practice it in our daily lives.
5. Avert catastrophe by meeting the crisis in European aid.
6. Realize that peace can never be purchased with power. "Peace is not for sale to the people who buy the heaviest guns."
7. Shoulder our responsibilities, keep our heads out of the sand, back our convictions with such strength as we shall need.

This, in brief, is the Bradley formula for peace. On the basis of past experience, we are fools to expect that wealth, benefit, or welfare can come out of war. War is a process of destruction that impoverishes peoples and destroys nations. The best that we can hope for after another war is a brave new world of rubble and freedom.

Let us keep our freedom and, if possible, avoid the rubble.

Gen. Omar Nelson Bradley, Chief of Staff, won his wartime advancement on the battlefield. He first commanded a division, then a corps, then an army, and finally a group of armies. This last command numbered more than 1,300,000 combat troops and was the largest body of American soldiers ever to serve under a single field commander.

Three weeks after V-E Day he was drafted to become head of the vast eight-billion-dollar Veterans Administration during the critical postwar demobilization period.

Born in Clark, Mo., on February 12, 1893, he was appointed to the U. S. Military Academy in 1911. During World War I, Bradley served with the 14th Infantry Regiment and rose to the temporary rank of major. During the peace years he continued his military studies, served for a time as instructor at West Point, and became commandant of the Infantry School. Within two months after Pearl Harbor he was given his own division.

Early in 1943 Bradley was called to North Africa and given command of the II Corps. After the fall of Bizerte, he commanded the corps during the brief Sicilian campaign. In 1944 he landed in France with his First Army to break the Atlantic Wall. With the liberation of France, he assumed command of the Twelfth Army Group which broke the Siegfried Line and pushed on to the Rhine and victory.

General Bradley resigned as Veterans Administrator in December 1947 to familiarize himself with Army problems before succeeding General Eisenhower as Chief of Staff.—THE EDITORS.

PUSH BUTTON WARFARE *is being waged against the secrets of nature in the supersonic wind tunnel at Aberdeen Proving Ground, Md., where the shapes of new high-speed missiles are being determined. The switch panel at the left controls the tunnel's compressors and numerous valves which regulate the air speed.*

Economic Mobilization

Readiness for War Rather Than Mere Potential Has Now Become Necessary

by

Hanson W. Baldwin

Economic mobilization must have public interest and support for it holds the key to future victory

"BATTLES," wrote William James, "are only a sort of public verification of mastery gained during 'peace.'" And the big factories rather than the big battalions *were* the principal architects of victory in World War II.

The big factories rather than the big battalions are still among the primary bulwarks of our military strength in this era of nonshooting war.

And the big factories rather than the big battalions may be the principal architects of victory in another war.

In this era of total war it is no longer sufficient to think in terms of "industrial mobilization"—the term is too limited. The revised concept is "economic mobilization," which includes industrial preparedness as one of many items.

Thirty-five basic elements, functions, and controls are involved in the modern concept of economic mobilization. They are listed on page 375.

The modern frame of reference for economic mobilization, in other words, includes nearly all the elements of national strength.

"Readiness" Essential

It is no longer adequate to think of industrial or economic mobilization in terms of a blueprint to be implemented at the start of a crisis. Long-range air power, the atomic bomb, and guided missiles have transferred the emphasis on the economic front as well as in the armed services from mobilization potential to readiness potential. The term "economic mobilization" presents, therefore, something of a study in contradictions; it must be interpreted as *including economic readiness.*

William Liscum Borden in his book, "There Will Be No Time," argues effectively for economic readiness rather than economic mobilization and stresses the obvious—that a strong military posture, an offensive posture, reduces the atomic threat to our cities and industries.

But his thesis goes much too far when, in emphasizing economic readiness, he virtually dismisses economic mobilization as useless. The "wartime weapon," he writes, "which the atomic bomb renders obsolete is not navies—it is cities and industry."

There is no doubt that the cities of the world huddle under a threat of death and destruction in the atomic age unparalleled in the life of man. There is no doubt that dispersion and decentralization (*i.e.,* de-urbanization) would be the ideal answer to the clouds of warning that darken urban civilization.

But to dismiss the possibility of utilizing the great energies of our urban centers and of our industry *after* war starts is dangerous dogma, which is dependent for its validity upon a prophecy which no man can make with certainty—the prophecy that the next war will be won or lost in the first few days, long before our factories could be mobilized for maximum output. Now this prediction may turn out to be true, but if it does not and we are not prepared to mobilize economically, we shall lose the war.

There will be few, therefore, who will agree with the conclusion implicit in Mr. Borden's book, that economic mobilization in the atomic age is worthless. It is, to the contrary, more vital than ever before. Plans for economic mobilization are of tremendous importance to a democracy, particularly in the atomic age when time may mean victory, for a democracy rarely strikes the first blow in war. In order to make sure that our advantage in vitality and dynamism is not destroyed at the very start of war, we must have time-saving plans.

Achieving a Balance

The modern problem of industrial mobilization is to achieve a nice balance between economic readiness and economic mobilization and, in giving new emphasis to the former, to avoid in so far as possible dislocation to our economy and the further extension of Federal controls which preparations for war always mean in time of peace.

It is clear that the timetable of technological development will affect the relative emphasis to be placed on "readiness" and on "mobilization." In the next decade or so, while the conventional weapons that won World War II are still in the ascendancy, we can still count heavily upon mobilizing the Nation economically *after* war comes. But when intercontinental missiles come to the world we must put more emphasis upon economic readiness *prior* to the outbreak of war and less upon economic potential to be realized after war comes.

First, and most important, we must recognize and stress that we cannot achieve *complete* economic readiness. In other words, we cannot fully mobilize the Nation economically in time of peace without becoming a "garrison state" economically (and probably politically and psychologically) and without eventual bankruptcy. But there are measures which can be taken with political and economic safety which will promote our military effectiveness.

The economic readiness measures, which also, of course, aid economic mobilization, are several; some of them, however, pose major problems to a nation never heretofore used to "live" frontiers:

1. There must be an immediate formulation of our peacetime military requirements, productionwise, for long-term periods. Because of the changing technology of war and the inconstant factor of world politics, this formulation cannot be constant or forever fixed. But it can be programed for a 3- to 5-year period.

Mr. Baldwin is the military and naval correspondent of *The New York Times.* This condensation of a chapter from his new book, "The Price of Power," is printed here with acknowledgment to Harper & Brothers who published the book for the Council on Foreign Relations. "The Price of Power" has been selected as the American Ordnance Association's Book of the Month (see p. 417).

THE BASIC FACTORS OF ECONOMIC MOBILIZATION

1. Allocations
2. Civilian protection
3. Communications
4. Conservation
5. Demobilization and reconversion
6. Facilities
7. Food and agriculture
8. Foreign economic relations
9. Fuel
10. Housing
11. Intelligence
12. Legal and legislative basis for economic mobilization
13. Man power
14. Materials
15. Morale
16. Over-all coördination
17. Personnel for staffing and war organization
18. Power
19. Price control
20. Priorities
21. Procurement and procurement coördination
22. Profit control
23. Public health
24. Public opinion
25. Public works
26. Rationing
27. Requirements—civilian
28. Requirements—foreign claimant
29. Requirements—military
30. Research and statistics (the factual basis for policy and administrative action)
31. Security
32. Technological progress
33. Transportation
34. Wage control
35. War finance

This industrial "5-year plan" must take account of strategic and tactical changes caused by technological developments. In our first 5-year plan, for instance, major emphasis ought to be given to heavy bombardment airplanes, but in our second 5-year plan the development of antiaircraft weapons and of short- or medium-range missiles might well shift production emphasis to antiaircraft missiles and naval rocket launching ships.

Building programs of this nature have long been a familar part of naval authorization bills, but Air Force and Army equipment always has been provided during peacetime on a wasteful, hand-to-mouth annual basis. It is vitally important to intelligent planning and production that 3- to 5-year authorization programs for *all* military equipment be initiated.

2. The long-term formulation, or blueprinting, of peacetime military requirements must be accompanied by a fixed annual production of munitions of all kinds. Economic readiness must imply a stock of modern weapons on hand and ready for use and a steady and continuing production of a definite annual quantity of the latest weapons. The amounts to be produced must be based on a progressive replacement program to prevent the obsolescence of our military equipment.

Materiel Replacement

Airplanes are outmoded rather rapidly. Perhaps twenty to twenty-five per cent of our operating and active reserve planes ought to be replaced annually. Ships normally have a somewhat longer life; a ten per cent annual replacement program for naval material would seem adequate.

Army equipment must also be replaced on an annual percentage basis, to be estimated as a function of the useful "life" of individual items. Rockets and rocket launchers might become obsolescent quickly and require 100 per cent replacement in any 3- to 5-year program, but rifles and small arms might continue to be useful in their present form for twenty years.

3. A 3- or 5-year production plan plus an annual production output implies, of course, certain corollary measures—the production and availability of sufficient machine tools, factory space, agricultural output, raw materials, etc. Since the amounts produced under any economic-readiness plan—though they must be far greater than any prior American peacetime munitions program—would be only a fraction of the potential contemplated by an economic-mobilization plan, these items should offer no serious technical or production problem in peacetime.

Economic mobilization is inherently a far more abstruse, intangible, and difficult problem than economic readiness, for the latter, though highly important, is only a part of the former.

The requirements for sound economic mobilization in the future—*i.e.*, for designing and developing means and methods of harnessing as rapidly as possible the total economic strength of the Nation to the cause of victory—are many and complex.

The A-1 priority is the detailed integration of economic mobilization planning with strategic planning. This always has been hampered by the ultra-secrecy of those officers who are charged with the duties of preparing war plans and the traditional reluctance of the military mind to share "official" secrets with civilians.

Yet no realistic economic-mobilization scheme can be made—for that matter no reasonable strategic plan can be made—unless both are made together. The first and fundamental requirement in economic mobilization, therefore, is a wedding between economic planning and strategic planning, between requirements and production.

"It is better to plan too big than too little," in the words of Stacy May. All the resources of national power must be tapped in any future war.

Military economic mobilization is only one phase of the total problem of economic mobilization. A National Service Act controlling and directing the allocation of labor may, for instance, be a fundamental requirement in the next war. Civilian economic mobilization is fully as important as plans and policies designed to provide equipment, food, etc., for the armed forces. Too much emphasis on munitions production at the expense of shelter or protective equipment for the "home front" might cost us the next war.

Civilian, not military, control must guide economic mobilization in war and in peace. This does not mean the exclusion of the military from economic mobilization; no project that does not include the military and give great weight to their programs, policies, and opinions will work. The military must have a big voice in the "what, when, and where" of the program; the civilian must decide "how."

Product of Teamwork

In the strictest sense, economic mobilization is the product of civilian and military teamwork. But in the final analysis the civilian must predominate.

This is not only because of the primary importance of the home front in any future war and the great importance of meeting at least minimum civilian needs, but also because the civilian by training and knowledge is better equipped to cope with economic and industrial problems than a military man.

Any economic-mobilization plan must be as flexible as possible and must provide the greatest possible autonomy, in design and execution, for industry,

labor, agriculture, etc. The fewer controls the better, but, given total and atomic war, controls are bound to be many. They must be effective, and they must be flexible, and there must be a certain degree of centralization of authority. But, under this centralized authority, responsibility should be delegated and operations decentralized to the fullest possible extent.

Private Industry the Answer

Decentralization and flexibility mean, it should be needless to say, competitive, privately owned industries rather than Government-run or Government-subsidized industries. It has been suggested that the aircraft industry ought to be subsidized. But there should be no subsidy other than the military budget. We must provide funds to procure enough military aircraft, but the industry itself must be privately owned. This is a "must" for any sound economic mobilization.

The total-requirements program for any economic-mobilization plan must be reconciled carefully under civilian direction wtih the available national resources. This "matching" of total requirements against total resources must be detailed and periodic, for technological developments will create constantly changing requirements in raw materials.

Any sound economic-mobilization plan must consider the national welfare in peace as well as in war. Past plans or the execution of them have been geared too much to the single concept of military victory, without sufficient consideration of "winning the peace." If we strip ourselves completely of our resources, military victory may have little meaning.

Such are some of the general principles which must govern the development of a sound economic-mobilization plan. There are many specific policies which must be implemented to carry these principles into execution.

Economic mobilization must study the best means of reducing the vulnerability of our factories and transportation networks to the atomic bomb, and it must continue the dispersion and underground-facilities studies already started by the Munitions Board.

Conserving Our "Know-How"

Proper economic mobilization must take account, sooner or later, of the problem of conserving, perhaps of monopolizing, our technical "know-how." Until recently, technical processes and production "know-how" at which Americans excel have been virtually free for the asking to any foreigners; even today we are teaching many Russians processes which they could not learn elsewhere.

This technical knowledge is the warp and woof of our military strength; it is, indeed, shortsighted to permit its "export" without some equivalent exchange. Some export controls on materials, exist, but so far slight attention has been given by the Government to the export of technical knowledge.

The modern problem of industrial mobilization is to achieve a nice balance between economic readiness and economic mobilization and, in giving emphasis to the former, to avoid dislocation to our economy and the further extension of Federal controls.

We must avoid lowering a complete "American iron curtain," but U. S. firms are entitled to some guidance from the Department of Commerce and the State Department when they are confronted with requests to train foreigners in their factories, and the State Department, in turn, might well consider such requests on a reciprocal basis.

Finally, the education of the services, particularly of the air services, to sound principles of economic mobilization and the revision of their staff and administrative economic-mobilization organizations are imperative. Too much lip service and too little action have been given in the postwar period to economic mobilization.

This function of education is primarily the responsibility of the Industrial College of the Armed Forces, but an even greater share of responsibility rests upon the top echelons of command in the services. Our military leaders must become "industry-conscious"; they must make their subordinates aware of the vital importance of economic mobilization.

There must also be a clear understanding of the rôles of the National Security Resources Board and of the Munitions Board. The former—by law and concept—is the over-all, broad economic-mobilization agency; the latter is primarily concerned with the Military Establishment. There is room however for confusion and cross-purposes unless these functions are kept in mind and close integration of effort is achieved.

Top Mobilization Agencies

The National Security Resources Board, the Munitions Board, and the Industrial College of the Armed Forces are the top-drawer mobilization agencies; they can blueprint economic mobilization in broad organizational strokes and can lay down basic principles and policies. But the actual executing agencies (in peacetime) are the services themselves, and the efficiency of economic mobilization depends fundamentally upon how well the services adhere to basic principles.

The Army, particularly Army Ordnance, which is the real "father" of modern industrial mobilization, has learned its lesson well, and the surface Navy also has learned through bitter experience. Both are well organized to take advantage of the talent and ability of industry through the American Ordnance Association and the Navy Industrial Association.

But the U. S. Air Force in particular and the Navy's air arm have lent chiefly lip service to economic mobilization. In staff work and administration, economic mobilization has been relegated to a subordinate agency of current procurement—a profound mistake. The "pilot psychology" of the flying services, which considers a "hot" plane as the first requirement, has given far too little attention to producibility.

Public Apathy

There is another weakness, and that is the public apathy about the importance of economic mobilization as a weapon of military victory and its importance to the lives of each of us. Our economic strength won World War II; it remains the greatest element of our strength today. Yet the speed and range of modern weapons can reduce the importance of this potential unless we create a plan to utilize it rapidly.

Public support can be enlisted for economic mobilization, not only by a proper public-relations policy which will keep the planning and its importance actively before the public but by full and energetic participation in economic planning by qualified representatives of industry, labor, agriculture, and the public chosen for their ability and influence with the people.

The Air University

Tremendous Speeds of New Aircraft Demand New Concepts of Application

by

Maj. Gen. D.M. Schlatter
Deputy Commanding General for Education, Air University

The military airman must have a complete and thorough knowledge of the machinery of our modern civilization in order to be able to cope with the multiple aspects of global war

AIR University is a centralized, coordinated system of education unparalleled in the history of the world's military establishments. Envisioned years ago by top Air Force leaders, Air University is today a tangible institution which embodies completely new trends in its up-to-date curriculum which includes study regarding every phase of the air power of today and tomorrow.

Gen. Carl Spaatz, Chief of Staff of the new United States Air Force, said on September 3, 1946, when the Air University's two senior schools welcomed their first classes:

"All of us here, who know the air as a profession, have long been conscious of the compelling need for time —time free from other duties, time for study, time to think into the future. We want to see the world not only as it is, but as it will be in five years' time or in a decade. For that we need quiet, in an academic center of our own."

Thus, a new period in military aviation dawned when the Air University was established. In this new era, airmen are encouraged to utilize original thought in the evolution of solutions to Air Force problems and in strategic planning for the future. Global and polar concepts have entirely replaced old, outmoded ideas. No longer does the military airman consider strategy in terms of stretching out to the east or to the west across broad oceans—oceans that were once natural barriers and, as such, protection from aggressor nations. Instead, he thinks, studies, and plans on a global scale.

The significance of Air University is easy to understand when one considers the endless problems synonomous with survival in a world of rapid technological advances, each of which holds strong implications for all elements of human society. Gone is the day of cut-and-dried divisions within the military airman's scope. No longer is it sufficient for him to be skilled in the tools of his trade. Today he must be aware of the close proximity of the military, industrial, and political spheres.

To cope with the social responsibility that is his because of the advent of superweapons, he must be well versed in those subjects which tend to achieve a thorough comprehension of the innermost machinery of modern civilization —engineering, pure science, international relations, personnel management, business administration, geopolitics, economics, and the humanities.

New developments in aircraft have changed the airman's approach to problems of war.

University Schools

Commanded by Maj. Gen. Muir S. Fairchild, Air University consists of the Air War College and the Air Command and Staff School located at Maxwell Air Force Base, Montgomery, Ala., along with command headquarters; the Air Tactical School at Tyndall Air Force Base, Panama City, Fla.; the Special Staff School, Craig Air Force Base, Selma, Ala.; the School of Aviation Medicine, Randolph Air Force Base, Tex. Air University also supervises the curriculum of the Institute of Technology, Wright-Patterson Air Force Base, which is operated by the Air Matériel Command to ensure its coördination in the Air Force educational system.

In general, Air University, operating as a major command directly under the Chief of Staff, USAF, is responsible for the over-all educational program to provide career development for Air Force officers. To the end that this program will be maintained at the highest level of efficiency and effectiveness, Air University conducts a constant study of the Air Force's educational requirements. Therefore, its mission is necessarily very broad and is limited only by the scope of the Air Force's educational problems.

To prevent duplication and overlapping in the Air Force's academic system, Air University must keep abreast of all other commands and their respective missions, particularly the Air Training Command.

In keeping with Air University's policy of avoiding the dangers of traditionalism and rigidity of thought, the entire educational system is flexible. When a gap is revealed in the system,

steps are taken immediately to remedy the situation. By the same token, revisions are recommended when deemed advisable. Students as well as staff and faculty members are free to offer suggestions concerning curriculum or facilities.

The ultimate product of Air University is an officer who is competent to envision the potentialities of future aërial warfare and to cope with them in a forceful manner. He must develop his fundamental powers of thought. He must think clearly, vigorously, objectively, independently, and globally. His education must be built upon the principle of receptivity of new ideas; therefore it begins early in his career. He goes to the Air Tactical School within his first six years of commissioned service. There he is prepared to command a squadron or for comparable staff duties. The curriculum is designed to give him an orientation on the Air Force as a whole and to point out his rôle in it as a junior officer with definite responsibilities. The course here is sixteen weeks long and is given three times a year.

Work at the Air Command and Staff School is more advanced. It deals primarily with why, when, where, and how to apply air power. Instruction is geared to prepare the students for the command of groups and wings and for staff duties appropriate to those grades. Stress is also placed on coördination and coöperation among air, land, and sea forces, as it is at all Air University schools.

An officer attends this school between his sixth and eleventh year of commissioned service after being carefully selected upon the basis of merit. Eventually, another requirement will be graduation from the Air Tactical School.

Previously a 9-month course, it will be shortened to five months starting in July 1948 and will be given twice a year, with increased enrollments.

The Air Command and Staff School also has two 3-month associate courses each year for Air National Guard and Air Reserve officers.

The Air War College

Highest ranking school within the Air University framework is the Air War College with the mission of preparing selected senior officers for top command and staff duty. In actuality, it is the thinking and planning group for the Air Staff in Washington. Through its seminar study, where students and instructors work on a partnership basis, solutions are unfolded for current Air Force problems. In considering air power in its broadest aspects, students are encouraged to render astute appraisal of Air Force concepts and doctrines, tactics and techniques, equipment standards, and trends of technological development.

About one fourth of the graduates of the Air Command and Staff School with ten to twenty years of service will eventually be chosen to attend the Air War College's 9-month course.

Specific needs of the Air Force are the yardstick for the Special Staff School's curriculum. Courses are currently offered in military management, general air inspection, staff intelligence, public information, and staff communications. A course for key staff officers in the comptroller system and a course for academic instructors will be added during the coming academic year.

Civilian Educators Called

When plans for Air University were made, the Air Force realized and admitted that it possessed the "know-how" of aërial warfare and its ramifications but that the ability to impart this knowledge to students was not necessarily a quality of most Air Force officers. Therefore the decision was made to tap civilian educational resources to the fullest extent possible.

The Educational Advisory Staff was created to advise the commanding general, his academic staff, and the commandants and faculty members of Air University upon educational matters.

General Spaatz, in July 1946, invited twelve of the Nation's most distinguished educators to form Air University's Board of Visitors. This board periodically visits Air University for careful scrutiny and then reports in detail to General Spaatz upon its progress.

In addition, some 1,200 Air Force officers are currently enrolled at leading civilian institutions all over the country, studying courses not available at Air University schools. This program was set up in connection with the Air Force's desire to assure educational coverage in all desired fields as well as to prevent duplication within its educational system. Why establish an advanced management course at the Air Command and Staff School when a better course is available at a well-known civilian college?

This program is administered by Air University, and the selection of officers to these courses is recommended by Air University. Among the schools to which Air Force officers are assigned are Massachusetts Institute of Technology, University of Southern California at Los Angeles, Georgetown University, Harvard, University of Texas, Carnegie Institute of Technology, Yale, and Princeton.

Civilian Liaison

A close liaison with the civilian world in the United States has been accomplished in two other striking ways. A number of outstanding civilians from nearly all fields of endeavor—medicine, science, aviation, industry, education, journalism, religion—come to Air University schools frequently as guest lecturers along with high-ranking Air Force, Army, and Navy officers.

Then, Headquarters, USAF, selected Air University to be the host for the series of Air Force-civilian seminars which began last year in an attempt to achieve a closer relationship between the civilian and military elements. At these seminars, the third of which will be held in May of this year, the Air Force presents its problems for seminar discussion. A better understanding of the Air Force is achieved thereby, and the Nation's key civilian figures get acquainted with Air University.

Air University has been highly acclaimed since its establishment two years ago. Distinguished military and civilian visitors, including representatives of foreign nations, have hailed it as a most impressive and unique educational institution. Indicative are these remarks by Max B. Cook, Scripps-Howard aviation editor, which appeared in the New York *World-Telegram* on February 6, 1948:

"Here, at the greatest air university in the world, the best civilian, scientific, and military brains in the United States are evaluating the latest, most modern aërial war equipment and planning how best to use it."

Signal Corps

The Nuremberg Trials

Did They Seek Justice or Did They Sanction Revenge?

by

Maj. Gen. J. F. C. Fuller

"To suppose that vengeance, however well merited judicially, will lead to a state of peacefulness has been contradicted by history again and again."

THE London Agreement of August 8, 1945, signed by the United States, the United Kingdom, the U.S.S.R., and France for prosecuting and punishing enemy war criminals under *ex post facto* law, created a precedent which will profoundly influence future warfare for good or evil. Which is it the more likely to be?

In seeking an answer to this question, it would be redundant to examine its legal side: this has already been done *ad nauseam*. Instead, it is the psychological side which requires examining, and until it is done, legal argument can only cloud the issue.

In tackling this problem the first question to ask is: Why was it found necessary to supplement international law, as laid down in the Geneva and Hague Conventions, by legislation as uncongenial as *ex post facto* law is to accepted jurisprudence.

The answer is that the existing codes, known as the laws and usages of war, were designed to moderate the violence of war, not to provide sanctions for vengeance. They were intended to apply only to warfare between civilized nations where both parties understood them and were prepared to respect them. They did not apply to wars between uncivilized states and tribes.

The difference between the recent war and most former wars waged by civilized nations was that, in the true meaning of the word, it was not a "civilized" conflict; that is it was not a conflict between parties who were willing to respect the laws and usages of war and thereby limit violence. Instead, it was an unlimited or total conflict lacking an ethical code.

Among those shown in the prisoners' box in the illustration above are Herman Goering (front row, left), Rudolph Hess (second from left), next, Joachim von Ribbentrop. In the back row at left are Admirals Karl Doenitz and Erich Raeder.

Amity and Enmity

The background of this difference is examined by Herbert Spencer in his "The Principles of Ethics." He points out that there are two codes of human behavior. The one he calls the "Code of Amity" and the other the "Code of Enmity." These he describes as follows:

"Rude tribes and civilized societies have had continually to carry on an external self-defense and internal co-operation, external antagonism and internal friendship. Hence their members have acquired two different sets of sentiments and ideas adjusted to these two kinds of activity" (Vol. I, p. 322).

"A life of constant external enmity generates a code in which aggression, conquest, and revenge are inculcated,

---

General Fuller, noted British soldier-author, is one of the outstanding military analysts and historians of the present day. As an officer in World War I he was one of the foremost advocates of tank warfare and did much to mount the armored attacks that proved the value of the bulletproof track-laying vehicle. He is a Companion of the Bath, a Commander of the Order of the British Empire, and a Companion of the Distinguished Service Order.

Courtroom in the Palace of Justice, Nuremberg, during the war crimes trial.

while peaceful occupations are reprobated. Conversely, a life of settled internal amity generates a code inculcating the virtues conducing to a harmonious coöperation—justice, honesty, veracity, regard for each other's claims" (Vol. I, p. 471).

"Justice Is Collective"

Commenting on Spencer's analysis, Prof. Sir Arthur Keith, the British anthropologist, points out that, "Under the ethical code [Code of Amity] justice is individual; each man is made to suffer only for his own misdeeds. Under the cosmical code [Code of Enmity] justice is collective; the tribe or community has to suffer for a crime of any one of its members." Translated to the realms of peace and war, Polemarchus in Plato's "Republic" expresses it as follows: "Justice is helping friends and harming enemies."

Because in Hitlerite Germany the Jews were considered the internal enemy of the German people, they were condemned racially—that is, collectively. Similarly, in his address on "The Meaning of the Nuremberg Trials," given at the Palais de Justice in Paris on April 25, 1947, Brig. Gen. Telford Taylor, U.S.A., Chief of Counsel for War Crimes, stated: ". . . what is really at stake now is not the lives of the particular generals who are defendants in these proceedings but the future influence of the German General Staff within Germany and, consequently, on the lives of the people in all countries."

In the one case the Jews had to suffer because they were of a race abhorrent to the Nazis; in the other the generals have to suffer because they were of an organization abhorrent to the world. To point a difference would be to split hairs.

Carried to its extreme, enmity justifies any and every atrocity as a peacetime or wartime necessity, even the annihilation of a sect, class, race, or community. This is illustrated clearly in the Old Testament, and more particularly so in "Deuteronomy," in which Jehovah, the tribal god of Israel, pushes enmity to its extreme by not only sanctioning but urging the racial destruction of the Hittites, Amorites, Canaanites, etc. Though on first thought it may appear strange that Hitler, the anti-Semite, fell under the spell of Jehovah, on second thought it is not, for the Old Testament Jehovah personified the code of revenge.

Therefore I will call its extreme form the "Jehovah Complex," and in more recent history it is well exemplified by the Puritan behavior toward the American Indians. Of it William Christie Macleod, author of "The American Indian Frontier" and other works on the Indians, points out that the New England-Indian policy was patterned upon the slaughtering of the Canaanites by the Israelites. A few examples will show how enmity, when carried to extremes, will turn a people, who as individuals are kindly and just, collectively into monsters who are brutal and savage.

On one occasion, during the Pequot War of 1637-1638 which was precipitated by the English settlers, an Indian village was surrounded by night, fired, and its sleeping inmates slaughtered. Bradford, the governor of Plymouth Colony, describes this "victory" with peculiar relish.

"It was a fearful sight to see them frying in the fire and the streams of blood quenching the same, and horrible was the stink and stench thereof. But the victory seemed a sweet sacrifice, and they gave praise thereof to God, who had wrought so wonderfully for them . . ."

On hearing of the massacre, the Rev. Cotton Mather hastened to his pulpit "and praised the God of New Israel, blessing Him for that 'on this day we have sent 600 heathen souls to hell'."

Occultly and psychologically, these happenings form the distant background of the London Agreement of August 1945, a background which right through history becomes the foreground when enmity inhibits a people. Let us trace its recent growth.

All Committed Atrocities

Taking into consideration the provocation, mutual insults, and six years of violent propaganda, in 1939 the war opened on what may even be called amicable lines, the laws and usages of war being moderately well respected. But as the war lengthened out, more and more did the code of enmity come to the fore until ultimately the Jehovah complex once again dominated the belligerents. All parties committed atrocities, some specializing in one kind, some in another.

In the United Kingdom, as early as 1941, Morley Roberts, a scientist, was badly bitten by this concept. He went so far as to write: "But if the Germans are again overcome it must be held that the massacre of a whole population is justifiable if no other means can secure an inoffensive nation or nationality."

A year later, the press was vomiting forth brutalities against the German Canaanites. In England the *Sunday Express* shrieked: "Blast and bomb, attack and attack, until there is nothing left where once man worked and lived."

In nearly every newspaper in all the belligerent countries it was probably much the same. To commit atrocities was just retribution; to suffer them devilish barbarity. Germany's invasion of Poland was a wanton aggression; Russia's of Finland was, after 1941, overlooked. The German massacres of Jews sent the allied powers into hysterics; the Russian massacres of Polish officers were hushed up. Right was always on one's own side, wrong on the enemy's. Thus by 1945 the civilized world had become a Manichean madhouse.

It was in the miasma of this psy-

chosis that the representatives of the London Agreement formulated their corpus of *ex de facto* law applicable to the enemy only. They could not think clearly; they could only feel acutely. Had they been able to breathe a cleaner atmosphere—that is, had they been surrounded by the conditions the compilers of the laws and usages of war had been called upon to work in—there can be little doubt that they would have realized that unless retribution aided in the establishment of peace, punishment, however just, would be detrimental politically.

Peace Demanded Amity

Peace demanded amity; therefore the code of amity should have topped their thoughts as, after much opposition, it eventually topped the war-crimes problem on the conclusion of the Napoleonic Wars and the first World War.

To have shot Napoleon, as Blücher wanted, or to have hung the Kaiser, as Mr. Barnes, Labor representative of the British War Cabinet wanted, could not have possibly assisted in restoring sanity and amity to a demented world. Such actions, whether just or unjust, legal or illegal, could only have made another war all the more certain.

Unhappily, in 1945 the atmosphere was so poisoned that the representatives immediately succumbed to it, and, although no doubt in their minds they considered their decisions just, their hearts had run away with their heads; therefore they shouted vengeance. Who, in the circumstances, can blame them?

How to punish the criminals legally was the essence of the problem as they saw it. Hitherto, international law had never been provided with sanctions to its rules. To overcome this difficulty, as was the case in the trial of Charles I of England, they created an *ex post facto* law.

To Provide Sanctions

This time it was intended to provide sanctions to three categories of crimes: (1) war crimes, (2) crimes against peace, and (3) crimes against humanity. The first covered the acts declared unlawful by the Hague and other conventions. Under the second came planning, preparation, initiation, and waging of aggressive war; and, under the third, every imaginable atrocity "whether or not in violation of the domestic law of the country where perpetrated."

Further, it was decreed that all leaders, organizers, instigators, and accomplices who had participated in the formulation or execution of planning or committing these crimes were "responsible for all acts performed by any person in execution of such a plan."

It was ruled that the defendants were not freed by their official positions from responsibility; nor were they freed even though they had acted under orders. Further still, it was decreed that the German Government, the Nazi Party, the German General Staff, the S.S. and S.A., the great Flick group of industries, the immense I. G. Farben industry, etc., etc., were criminal organizations, membership of which in itself was punishable. In fact, the meshes of the crimes net were woven so small and the extent of the net itself was so large that any man or woman who had done no more than heil Hitler could be caught in it.

Are Trials Worth While?

Were these trials worth while, and are they worth while? As I write, they monotonously continue. General Taylor answers "yes," because punishment is a deterrent of crime and because they reëstablish and reaffirm "moral standards."

Do they and can they? Rather do these trials not remind us of a saying of Macaulay's: "We know of no spectacle so ridiculous as the British public in one of its periodical fits of morality." The same may be said of the American public, for both have a common Puritanical background.

Further, in discussing the crimes against humanity, Taylor says: "The 'public conscience' of civilization has, at least since the French and American Revolutions, condemned those massacres and murderous persecutions of population groups which have occurred most frequently in the past on racial and religious grounds."

Is this true? For in the lifetime of Taylor's father, certainly of his grandfather, the exterminative wars which were planned, plotted, and waged against the American Indians during the latter half of the nineteenth century equaled in atrocities anything the Nazis ever did and were extremely popular at the time.

"In Oregon," writes Macleod, "the legislature, the subordinate Indian agents, the Methodist clergy, and the Know-Nothing political party all were directly implicated in carrying on systematically a series of massacres which no sane imagination would describe as they officially described it—as an 'Indian War'. Women were regularly clubbed to death and infants dashed against trees."

"Not an Original Idea"

At the trial of the Buchenwald ruffians it was alleged that the wife of the commandant of that concentration camp had lamp shades made out of human skin. Not an original idea, for in 1813, when the noted Shawnee chief Tecumseh was killed, "the Americans mutilated his dead body, flayed it, and made his skin into souvenir razor strops."

Do such things condemn the Americans as a barbarous people? Certainly not, for all they show is that when the Jehovah complex becomes an inhibition, a kindly and most generous people are rendered brutal.

Unless there is amity within a nation, anarchy will abound. And unless there is amity between nations, there can never be world unity or a world freed from war. The Nuremberg trials were fraudulent and are still so. Indeed they were worse than fraudulent, they were retrogressive. They did not reaffirm moral standards. Instead, by relying on *ex post facto* law, they abolished all existing standards. They set up a precedent which all civilized people may one day curse—that might is right and that the greatest crime in war is to lose it.

What Does This Mean?

What does this mean in the future? It means that when the war now brewing boils over, atrocities will reach their zenith. It matters not how belligerents fight, because all atrocities cannot altogether be avoided in war. Therefore, even should the losing side have fought like a band of saints, it will be at the mercy of the *ex post facto* vengeance of its conqueror. Consequently, the certainty is that all sides will fight like devils.

Therefore, what the Nuremberg trials have done is to Mongolize war. To suppose that vengeance, however well merited judicially, will lead to a state of peacefulness has been contradicted by history again and again.

The Cut Back Club

The Geniuses Who Kept Artillery Ammunition Production At a High Peak of Efficiency Despite Constant Changes

American industrialists overcame monumental difficulties that hampered operations to equip the greatest fighting force in history

THE men of American industry who turned to the production of artillery ammunition in World War II have a tremendous ability to get things done against terrific odds. They also have an unfailing sense of humor.

This was evident on all sides in the midst of war when they were commanded to do the impossible in the face of man-power and material shortages, lack of equipment and facilities, shortages of transportation, gripes of labor, hazards of security regulations, priorities, renegotiations, and, worst of all, cut backs.

Cut backs were those simple devices by which production was slowed down, built up, and slowed down again because of the constantly changing demand from fighting fronts all over the world. The Industry-Ordnance team was really discovered in the idea originated by Lieut. Gen. Levin H. Campbell, Jr., wartime Chief of Ordnance, of organizing the Industry Integration Committees.

Brig. Gen. Roswell E. Hardy, chief of the Ammunition Division in the Office of the Chief of Ordnance, was one of the first to put the Industry-Ordnance team, namely the Integration Committee plan, into operation. This made for an almost immediate and personal understanding between the Ordnance Department and members of industry whereby the production of Ordnance was like a Saturday night bath! You just turned on the spigot and, when you had enough hot water, turned it off; when there was not enough, you turned it on again!

Be that as it may, the men of industry had a sense of humor and they have it to this day. Hence the Cut Back Club.

Members of the Cut Back Club—all of whom are members of the American Ordnance Association—produced all kinds and types of artillery ammunition and its components from 20-mm. right on through to 240-mm. They also turned out everything required for the bomb program, and they likewise produced ground signal flares, hand grenades, mortar shells, rockets, and ammunition for bazookas.

Production Record

For the record, they produced 270 types of ammunition for a total of 900,681,530 rounds; of grenades, mines, and pyrotechnics, 117 types for a total of 160,799,999 rounds were manufactured; of bombs, 70 types for a total of 102,324,098 were fabricated.

But, besides a sense of humor, these gentlemen had invincible ability, stamina, and know-how, for they were representative of all American industry. There were the "Blue Ribbon" companies of course, the great mass producers whose power and genius for turning out machines for industrial and individual use in everyday life are bywords—the large steel mills, the railroad shops, the automobile plants.

But there was also that amazing galaxy of the small machine shops in the alleys. There were miracles of production by the strong and the weak, the great and the small.

And, too, there were the unheard-of industries. For example, a search was begun in the heat of war to find some one to make parachutes for the low-altitude bomb. The shoe-string industry rose to the occasion. At a hurried conference in Washington it turned out that there were some 15 to 20 plants in the United States whose normal peacetime production was solely shoestrings! This industry made all the shroud lines for our low-altitude bomb parachutes.

And so, under the leadership of Frank H. Higgins, vice-president of the Hupp Corporation, Detroit, the Cut Back Club—the ammunition makers of World War II—was organized. As Colonel Higgins, Frank did superb work as chief of the Artillery Ammunition Branch in the Ordnance Department of the Army throughout the war.

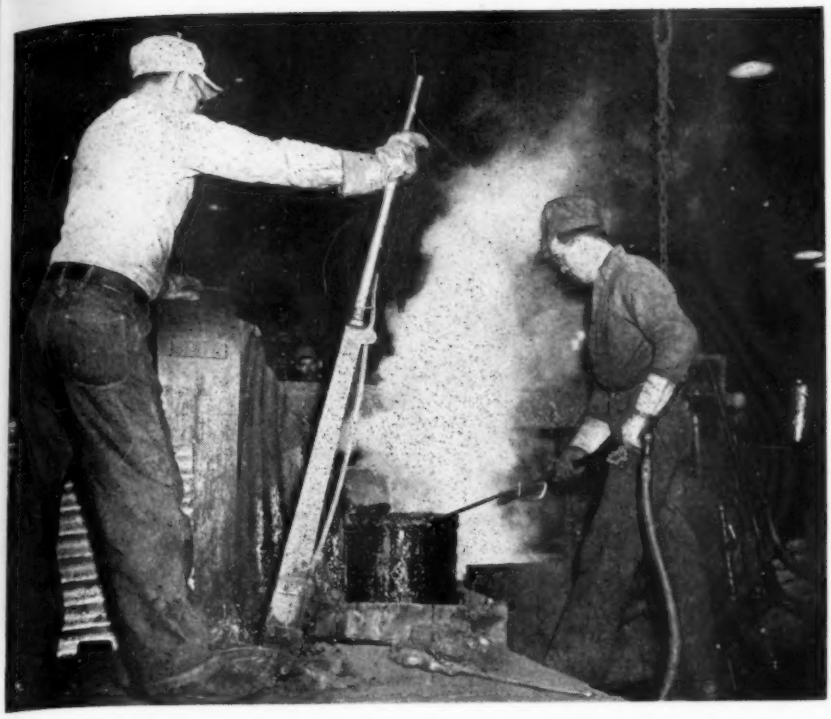
Frank H. Higgins

A number of men from the plants who did the great ammunition-production job, together with those who coordinated the job in Ordnance at Washington, saw the necessity to band together after the war, if only to preserve the precious know-how they had fortunately had time to acquire.

Next Meeting Planned

Plans are now being made to hold the second annual meeting of the Cut Back Club at the Book-Cadillac Hotel in Detroit on the evening of June 8th in connection with the Thirtieth Annual Meeting of the American Ordnance Association at Detroit on June 9th and at Selfridge Field on June 10th.

Better plan to attend! Get in touch with Frank Higgins or any of the other officers of the Club. They are: Vice-President E. S. Higginbotham, president, Tokheim Oil Tank & Pump Company, Fort Wayne, Ind.; Secretary-Treasurer S. E. Mullikin, general agent, Denver & Rio Grande Western Railroad, Cleveland, Ohio; Board of Governors: Brig. Gen. R. E. Hardy, Office of Chief of Ordnance, The Pentagon, Washington, D. C.; James D. Maitland, president, Cobusco Steel Products Company, Denver, Colo.; John Slezak, president, Turner Brass Works, Sycamore, Ill.; A. A. Busch, president, Anheuser-Busch, Inc., St. Louis, Mo.; and M. S. Falk, Jr., 17 East Sixty-sixth Street, New York, N. Y.



Industrial Readiness—Now or Never!

by

Rear Adm. Warren S. Parr

Our armed forces can only be as strong and as healthy as the industries that nourish them

TODAY, with the international situation ready to explode, the majority of our industrial leaders are complacently waiting for the Government to tell them what they should do with regard to their mobilization programs. They have apparently forgotten or fail to appreciate the lesson we learned in World War II that modern warfare depends upon the industrial capacity of a country as much as, if not more than, its armed forces.

The time required to convert our industrial capacity from civilian to military production can and probably will determine whether or not we will survive a World War III.

National defense has ceased to be a responsibility of the Government alone. Instead, it has become the responsibility of every American citizen along with the Government. We are all individually and collectively living in this house of ours that we call the U.S.A., and we must be prepared to extinguish immediately the first flicker of flame that appears if we are to save our home.

The Army, the Navy, and the Air Force merely correspond to the night watchmen who will start calling "Fire!" when fire appears. Industry and the country must be ready to come to their assistance without delay, however, if it is to be kept under control.

"In the War Zone"

Is our house about to catch fire again? Looking at the situation today in Greece, Trieste, Palestine, and China as well as in Germany, Italy, and France, it is evident that it is smoldering and that we are, as some columnists have expressed it, in "the zone of war."

An outstanding Army general of World War II, now president of one of our large industrial corporations, has been quoted as saying: "The might of American industry cannot again be mobilized *after* we are attacked in time to assure us victory against sure and devastating weapons of modern warfare. . . . By mobilizing America's industrial forces in advance, we make ourselves sufficiently strong that no potential foe will dare to attack us."

Yet the industrial corporations of the country today, with a few exceptions, are showing very little if any initiative in formulating their mobilization projects.

It has been estimated that the peacetime military production of any country normally can provide ten to fifteen per cent of its wartime requirements. Thus eighty-five to ninety per cent of wartime military requirements must be obtained by converting civilian to military production. Because of our Lend-Lease policy and foreign sales before our entry into World War II, much of our civilian production capacity was already converted to military production. In spite of this, however, we did not achieve our maximum military production in many industries until from eighteen months to two years after Pearl Harbor.

No Running Start

We cannot again hope to have the running start that Lend-Lease gave us. Furthermore, a time lag of even eighteen to twenty-four months in reaching maximum production in a World War III could prove fatal. The tremendous industrial production which will be required by the military with minimum delay when mobilization starts can only be achieved by intelligent, thorough, and well-coördinated mobilization programing by our country's industries. The Government, in addition to acting as the over-all coördinator, must take such peacetime preparedness measures as may be found necessary.

Russia has long been aware of the vital importance of an industrial-mobilization program. According to a recent article by one of our Government's leading experts on Russia, they have a military section staffed by army officers in "every sizable industrial

---

Admiral Parr (U. S. Navy, Retired), was formerly the War Plans Officer for the Deputy Chief of Naval Operations for Air and the aviation member of the Navy's Mobilization Planning Committee.

establishment in Russia, from the factory to the economic-cabinet ministry."

The function of this military section is to make war plans for its particular establishment and ensure that the peacetime civilian production can be readily and easily converted to military needs. Their planning is not for the purpose of avoiding financial losses but to ensure survival of the Soviet State.

Dual Responsibility

Today's industrialists are inclined to feel that the Government, specifically the Army, Navy, and Air Force, should pay for their industrial-mobilization efforts. Actually it is a dual responsibility and expense which each individual company must share along with the Government as administrative overhead or insurance.

Russia, which lacks our industrial power, maintains huge military forces in addition to her industrial-mobilization program. In these days of total war, when the time element is the all-important factor, if we do not have our industrial might ready for rapid war production we have the only alternative of maintaining huge military forces. These forces must be capable of holding off the enemy for eighteen months or two years until our industrial power can be mobilized if we are to survive attack.

The relative cost of these alternatives —that is high taxes to maintain huge armed forces versus the direct expense to industry of mobilization projects— is evident.

Lack of information regarding Government requirements is frequently given as an excuse for the lack of a mobilization program by industries. This alone should not deter them, for there is much that can be done preliminary to the final stage of operations.

Industry Should Assume Initiative

Each company should have within itself a complete mobilization-planning organization. Too frequently the executive responsible for his company's mobilization program has had it superimposed on a host of other duties that already are claiming twelve to fourteen hours of his day. He has no time to devote to mobilization projects except to think of reasons why his company is not doing it.

Mobilization planning is a full-time, continuous job—one which should stand by itself and have as its representative in top management an executive to defend it against peacetime practices.

Any plant expansion or changes in production methods should be reviewed for their effect on war production requirements. Layout of plants should be studied to ensure that not only will they fulfill their peacetime demands but will meet wartime requirements equally well.

National defense has ceased to be the responsibility of the Government alone. Instead it has become the responsibility of every American citizen along with the Government.

It is well known that there has always been a lack of close coördination between the military forces and industry with respect to war planning. Industry, with some justification, has said that it was not being given sufficient information to plan intelligently. The military forces, in turn, have said industry was too slow in giving them the industrial support they required.

Unquestionably, a close liaison and understanding must be maintained at a high level between industry and the military forces. This is necessary to enable industry to plan intelligently and to be prepared to shift over to military production requirements with minimum delay.

Up to the present time the military have been prevented from disclosing their plans to industry for reasons of security and the lack of security control once information was released. Such top-secret information as was released in the past was given only to high industrial executives who were sworn to such secrecy that they were unable to impart the information to their staffs in sufficient detail to ensure their best planning.

Industry in turn, except during full-out war conditions, has been hesitant to disclose its individual industrial and trade secrets to the military for fear that this information might reach a competitor. Thus there has been a "missing link" required to tie industrial and military programs compactly enough together to permit the best industrial-mobilization projects by either the military or industry.

Obviously these "missing links" between the planning of industries and the military, in order to function properly would have to be individuals of high integrity with planning experience and ability. They would also have to obtain the trust and confidence of both the military and the industrial organization by which the individual was employed. In order to have this trust and confidence, they would have to be subject in some measure to military jurisdiction and control and also to the jurisdiction and control of their individual company or corporation.

The specifications for these "missing links" at first glance appear unattainable, but with further consideration it is evident that there are such individuals in the ranks of retired military and naval officers. Many of these officers have retired comparatively young, have had the necessary experience, and have the engineering training and ability to assimilate readily the capabilities and engineering problems of an organization.

As retired officers they are still subject to military jurisdiction and general court martial if they make unauthorized disclosures of information regarding military plans. Thus, they are in a position, with suitable Government clearance, to maintain close liaison with the military and have information disclosed to them which otherwise could not be made available to civilian mobilization personnel.

"Know-How" Utilized

On the other hand, as officers or employees of their individual companies or corporations they would be subject to the control and jurisdiction of their organizations the same as any other member. They would be able, however, to utilize their "know-how" of military planning and their knowledge of existing projects to ensure that their respective companies' plans are kept closely geared to the existing situation and synchronized continuously with new developments or changes in military plans.

(Editor's Note.—Lest this article possibly be misconstrued as self-advertisement, the author has asked us to state that he has now established his own business and is not seeking employment as an industrial-mobilization planner.)

For Eminent Service We Salute These Industry-Ordnance Leaders

Oscar Webber

J. M. Kennedy

Mason Britton

C. H. Greenewalt

S. W. Cramer, Jr.

Oscar Webber, vice-president and general manager of the J. L. Hudson Company, Detroit, is a charter member of the Michigan Post of the American Ordnance Association, and of its board of directors. He continues to take an important part, as he did in World War II, in industrial preparedness in Detroit.

James M. Kennedy, vice-president Revere Copper and Brass, Inc., Rome, N. Y., is chairman of the Mohawk Valley Chapter of the Empire Post, American Ordnance Association. During World War II he directed with outstanding success a great part of the rocket production program.

Mason Britton, recently awarded the U. S. Medal for Merit, is president of the Metal Cutting Tool Institute, New York City. He filled a vital rôle in directing the increased production and distribution of machine tools vitally needed by industry and the armed services in World War II.

Crawford H. Greenewalt, tenth president of E. I. du Pont de Nemours & Company, Wilmington, Del., was largely reponsible for the Du Pont Company's part in the atomic-energy program.

Stuart W. Cramer, Jr., is deputy chairman of the Munitions Board, Washington, D. C., and formerly was president of Cramerton Mills, Inc. A graduate of West Point, he served in France in World War I, retiring from the Regular Army to enter commercial business in 1922.

Lewis H. Brown, chairman and executive officer, Johns-Manville Corporation, New York City, served as adviser to Lieut. Gen. Levin H. Campbell, Jr., Chief of Ordnance, 1942 to 1946, for which service he was awarded the U. S. Medal for Merit. He is the author of "Report on Germany."

Donald F. Carpenter, vice-president and assistant general manager of Remington Arms Company, Bridgeport, Conn., is chairman of the Military Liaison Committee, established under the Atomic Energy Act, and is deputy to Secretary of Defense James Forrestal on atomic-energy matters. He is a charter member of the American Ordnance Association.

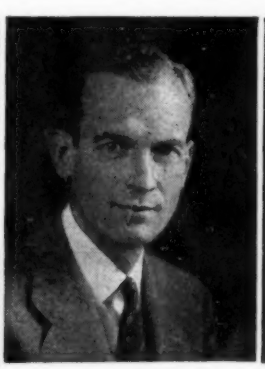
William Ryer Wright, a director of the Chicago Post, American Ordnance Association, is chairman of the Post's Committee on Student Activities. He served with distinction in the Ordnance Department of the Army in World War I. He is now energetically directing the Association's program for student activities.

F. R. Valpey is vice-president and general manager, Standard Products Company, Detroit, Mich. He is also chairman of the American Ordnance Association, Michigan Post Committee on Membership. He directed Standard Products' vast program of Ordnance production in World War II with notable success.

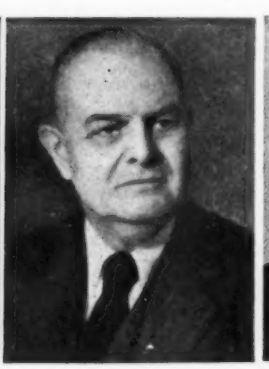
Frederick L. Devereux is special assistant to Lieut. Gen. Lucius D. Clay, Military Governor of Germany. He was formerly an official of the Bell Telephone System and Mayor of Bronxville, N. Y. He took an important part in the organization of the Office of the Chief of Ordnance—Detroit from its inception. He is presently stationed with General Clay in Berlin.

(*On this page in the last issue of* ORDNANCE, *Quincy Bent, who was cited for outstanding Ordnance service, should have been referred to as former vice-president of Bethlehem Steel Company—a position in which he achieved world renown.*)

Lewis H. Brown



D. F. Carpenter



W. R. Wright

F. R. Valpey

F. L. Devereux

Essentials of Security

The Life Blood of Armed Strength Is Resources

by

Arthur M. Hill

Chairman,
National Security Resources Board

If America is to assume the rôle of world leadership of free peoples, its words must have authority.

WE will all agree that we are living in an era of turmoil and uncertainty. We are not at peace with the world—actually or by statute. We are experiencing a "cold war." Perhaps a better descriptive term would be a state of world revolution with a conflict existing between two ideologies—international communism against the democratic way of life; slavery under dictatorship against democracy and a free way of living.

I feel that the recent remarks of that great world leader, Field Marshall Jan Christian Smuts, are so germane to the present occasion that I should like to quote his words as they appeared in *Time* magazine:

"Something is happening in the world today which is going to shake our civilization to its very foundations. What is called the new 'democracy' is making its appearance today—it has come to Czechoslovakia—but it is a state of things which in ancient days we used to call slavery. If a halt is not called, then the end of civilization, as we know it and cherish it, is inevitable.

"We are passing through the greatest crisis in human history. Fifty years from now the world may be an entirely different place. Are we going to play our part in it? Are we going to submit and bow down to it, or are we going to stand up to it and meet its challenge on behalf of human dignity?"

The recognition of such world-wide conditions on the part of our Nation is typified by the bipartisan approval and acceptance of the European Recovery Plan; similarly, in the acclaim and general acceptance in Congress of the findings of the President's Air Policy Commission and the almost identical conclusions of the Congressional Air Policy Committee.

We Must Support Our Commitments

Under no circumstances can we afford the risk of not being able to support our diplomatic commitments militarily. This Nation has fallen heir to world leadership, and we cannot avoid our responsibilities with honor or safety.

While much has been said with respect to our diplomatic and military problems, the plain unvarnished fact remains that our strength in the world stems from our resources—all of them. For the purpose of discussion and simplicity, I have listed them as human and spiritual, industrial and natural resources.

By human and spiritual resources I mean not only the men and women of the country from which source we obtain our leaders, scientists, professional people of all kinds, our labor and, in war-time, our soldiers and sailors as well, but also that dynamic force that has made America—the belief of our citizens in God, in our country and institutions, in the dignity of the free man, of generosity and fellowship toward other peoples. It is the spirit of this great Nation of ours. When the people of this land are informed and understand the issues, they may always be relied upon to pursue the right course.

Our techniques of mass production have made this Nation great in peace and invincible in war. They have given us the highest standard of living in the world during peace, and, as General Knudsen said during the war, "It deluged the enemy with production!"

General Eisenhower said recently that on D-Day plus four he flew over the English Channel and actually counted 300 ships damaged or sunken. Yet his armies still had adequate supplies to carry on, and he marveled with pride at the ability of his country to back up its military forces.

When we come to our natural resources, the picture is not quite so comforting. We have been prodigal with our natural resources for the benefit of the world, both in peace and war. While nature richly endowed this land of ours, it was never intended to be the storehouse for the world. Con-

The chief safeguards of peace are adequately trained men using the best equipment.

Mr. Hill delivered this address at the annual meeting of the Pittsburgh Post, American Ordnance Association, held in Pittsburgh on March 25, 1948, at the William Penn Hotel.

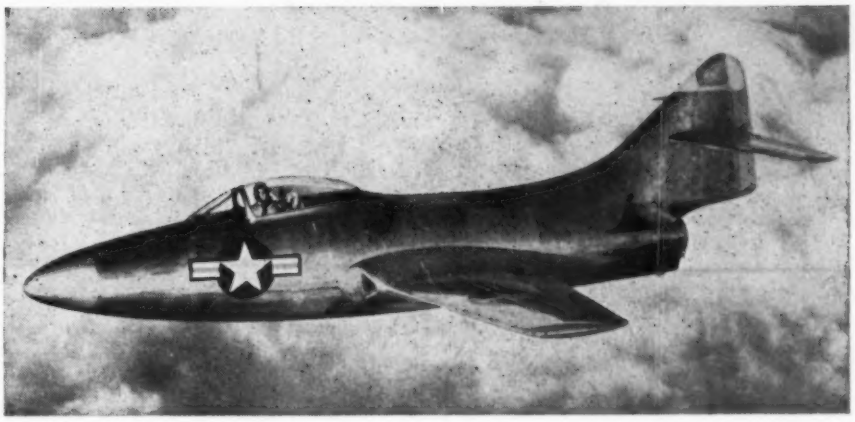
sequently, it seems timely to take stock of our situation and make our plans and arrangements for other sources of supply while conserving as much as is reasonably possible in our country for a rainy day.

Many Sources Lacking

Furthermore, there are many critical and strategic materials of which we have no sources in this country. We hope that arrangements of mutual interest will eventuate through the operations of our foreign-relations activities in the State Department and through the European Recovery Program that will channel greater supplies into this country. I am confident that in time this desirable condition will come about.

It is the tools of ordnance that give our Navy the means to command world respect.

Another great possibility is inherent in chemical synthesis. Our American-made synthetic rubber is a shining illustration of doing just that under pressure. Similarly, petroleum products, through synthesis, are already beyond the stage of mere speculation. Pilot and demonstration plants have been in operation for some time under the direction of the Bureau of Mines. Interior Secretary Krug has recommended a long-term program of construction and an immediate program to build three plants of commercial size for the synthesis of petroleum from coal by two different processes and one from oil-bearing shale.



Plentiful resources are necessary to make our air forces second to none in the world.

Notably, a great experiment is under way near Pittsburgh by two of our large corporations, the Pittsburgh Consolidation Coal Company and the Standard Oil Development Company. In Texas and Kansas commercial plants are under construction to convert natural gas into petroleum products and chemical by-products. Having been born in Charleston, W. Va.—the chemical capital of the world—I have unbounded faith in the possibilities of synthesis.

We are an enthusiastic people and sometimes we go too far, such as in the present use of oil in this country. Due to a combination of circumstances it would appear that all of us suddenly decided to install oil heat in our houses, in hotels, and in industrial installations. The cumulative effect, if it continues, will be a definite shortage of oil, which certain parts of the country felt keenly this last winter. It may be of interest to add in passing that jet engines use fuel from the same crude oil that is used for manufacturing heating fuel.

There are many fascinating possibilities of substitute materials under study and many beyond the laboratory stage. The developments have been of such significance as to require a re-examination of the critical stock pile list.

The National Security Act of 1947 provides for three coördinate agencies on an equal level: the National Military Establishment headed by the Secretary of Defense, established for unification of the Armed Services; the National Security Council composed of the President as chairman, the Secretaries of State, Defense, Army, Navy, and the Air Force, and the chairman of the National Security Resources Board, designed to keep abreast of events and situations throughout the world in their relationship to our own national security; and the National Security Resources Board, a civilian organization designed to advise the President concerning the coördination of military, industrial, and civilian mobilization in the event of war.

In addition to the chairman, the National Security Resources Board consists of the Secretaries of State, Treasury, Defense, Interior, Agriculture, Commerce, and Labor. Under the statute, the chairman of the Board must be appointed from civilian life, and reports directly to the President.

Vast Responsibilities

Coupled with the phrase "coördination of military, industrial, and civilian mobilization," the Board's duties and responsibilities are vast and cover virtually all aspects of our economy, except strategy and tactics of the military and the functioning of our foreign relations. The latter are integrated in the Security Council.

You may rightfully ask at this point what we have accomplished to date. The answer is that we have been organized slightly over three months, and we are still looking for the best talent we can find to head some of our important divisions.

Therefore, while I cannot be too specific in telling you what we have accomplished, I can say that in spite of a still incomplete organization, those of us who are on the job have already rolled up our sleeves and are making our best endeavor to be prepared for war whenever it might come.

To begin with, we have done somewhat more than dust off some of the more important records of World War II and are prepared to suggest ways of avoiding some of the more obvious mistakes that were made during that conflict. We are now far enough

removed from World War II to give us a fairly good perspective of the general pattern of industrial mobilization as well as a number of other important aspects of our national capacity to wage war.

We have had the benefit, for instance, of certain work on the subject instituted by the former Army and Navy Munitions Board and published in tentative form last fall as a master plan along with one of its hundred-odd annexes—that relating to the organization of the War Production Board.

Contact and Planning

One of the most important aspects of industrial mobilization is that of contact and planning between the military procurement agencies and their prospective suppliers. The output of certain industrial plants, as well as Government-owned plants and those which have been disposed of subject to the national-security clause, have been assigned to the various military services by the Munitions Board.

Through educational orders, coöperative engineering by Government and industry, procurement plans, and the like, many of the plants and industrial companies are already aware of their respective rôles and missions in war production, particularly with respect to military end products. It is obviously impossible to extend this method of output allocation down to the production of basic materials and certain common components which are necessarily subject to allocation.

Projects are under way for the study of the potential supply of various basic materials—of industrial capacity, transportation, power, and fuels—in order to weigh these capabilities against the estimated military and civilian requirements in the event of war.

We are making organizational charts of civilian wartime agencies, indicating their interrelationship in the light of experiences in World War II with the objective of smoothing out the rough places and of eliminating potential jurisdictional conflicts. It is our hope that much, if not all, of the authority exercised by some thirty-six separate agencies during World War II can be soundly coördinated.

We are undertaking the preparation of necessary legislation and executive orders. Equally as important, we shall endeavor to build up and keep a current roster of qualified men to be selected for the jobs outlined at the top echelons and to get them thinking of their problems in advance.

We need men with a knowledge of industry, production, machine tools, facilities, raw materials, management experts, men skilled in organizational problems, in personnel training, price controls, finance, economic stabilization, industrial engineering, and all the other facets of our economic life.

The following constituted the sponsoring committee for the annual meeting of the Pittsburgh Post:

J. A. Appleton, vice-president, Central Region, Pennsylvania Railroad Company.

H. G. Batcheller, president, Allegheny Ludlum Steel Company.

J. F. Drake, president, Gulf Oil Corporation.

B. F. Fairless, president, United States Steel Corporation of Delaware.

H. B. Higgins, president, Pittsburgh Plate Glass Company.

R. A. Hunt, president, Aluminum Company of America.

G. H. Love, president, Pittsburgh Consolidation Coal Company.

R. K. Mellon, chairman of the board, Mellon National Bank & Trust Company.

Ben Moreell, chairman of the board, and president, Jones and Laughlin Steel Corporation.

A. W. Robertson, chairman of the board, Westinghouse Electric Corporation.

Brehon Somervell, president, Koppers Company.

E. T. Weir, chairman of the board, National Steel Corporation.

W. P. Witherow, president, Blaw-Knox Company.

C. M. Yohe, vice-president, Pittsburgh & Lake Erie Railroad Company.

The Directors of the Pittsburgh Post are:

F. B. Bell, chairman of the board, Edgewater Steel Company.

R. C. Downie, president, Peoples First National Bank & Trust Company.

W. K. Fitch, chairman of the board, Dravo Corporation.

H. A. Gidney, vice-president and comptroller, Gulf Oil Corporation.

L. Iversen, president, Mesta Machine Company.

A. E. Walker, chairman of the board and president, National Supply Company.

I. W. Wilson, vice-president, Aluminum Company of America.

The officers of the Pittsburgh Post are:

President, H. C. Minton, vice-president, Koppers Company.

Vice-president, J. K. B. Hare, vice-president, Westinghouse Electric & Manufacturing Company.

Vice-president, T. E. Millsop, president, Weirton Steel Company.

Treasurer, T. H. Eddy, vice-president and treasurer, George A. Kelly Company.

Secretary, W. S. Rial, Jr., president, Morrison Rubber Company.

Requirements for Security

I am going to conclude with what I conceive to be some of the answers to the question: "What are the requirements for national security?" They are:

1. Pursue a clear, just, and honorable foreign policy.

2. Strengthen our armed forces and thus serve notice on friend or potential enemy that we have the military capabilities to back up our diplomatic commitments. To do this we should adopt without delay universal military training legislation to give our Nation powerful trained reserves over the course of the years ahead. We should immediately reënact Selective Service, as President Truman has recommended to Congress, to bring our armed forces up to the required numerical strength.

3. Increase our sources and our stock piles of critical and strategic materials. Direct our research and development activities toward the further discovery of substitutes by the application of science.

4. Encourage in every way new discoveries, in this country and in this hemisphere, of new sources of metals and minerals, including petroleum.

5. All the foregoing, while essential and important, will be of no avail unless supported by the mobilized spiritual resources of all the people of the United States.

It is our ardent hope that this Nation shall not be thrust into another armed conflict. We all hope that as disquieting world events unfold, both in the immediate and remote future, we shall all be able to keep our hearts and heads where they ought to be. But, if despite our best and most honorable efforts, war should suddenly descend upon us, let us be in a state of constant readiness. We shall make every honorable effort to prevent war. If our efforts are of no avail, we are determined to be prepared to win it.

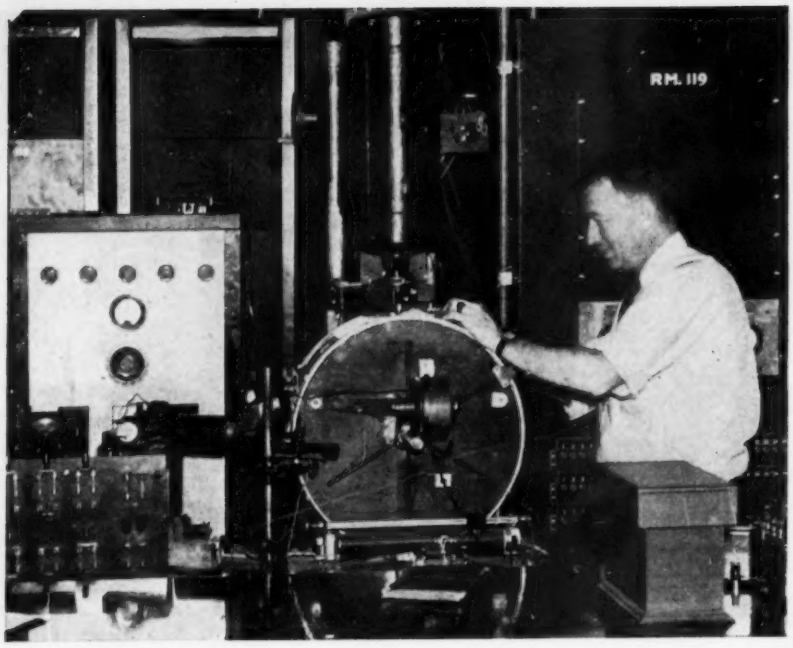
Research for Security

THE Ballistic Research Laboratories at the Aberdeen Proving Ground, Md., conduct basic research in ballistics and in the relevant branches of physics, chemistry, mathematics, and engineering. A resident and nonresident staff of scientific specialists is available to render expert consulting services to the various sections of the Ordnance Department and other governmental agencies in connection with the design of new weapons and the more effective use of existing ones.

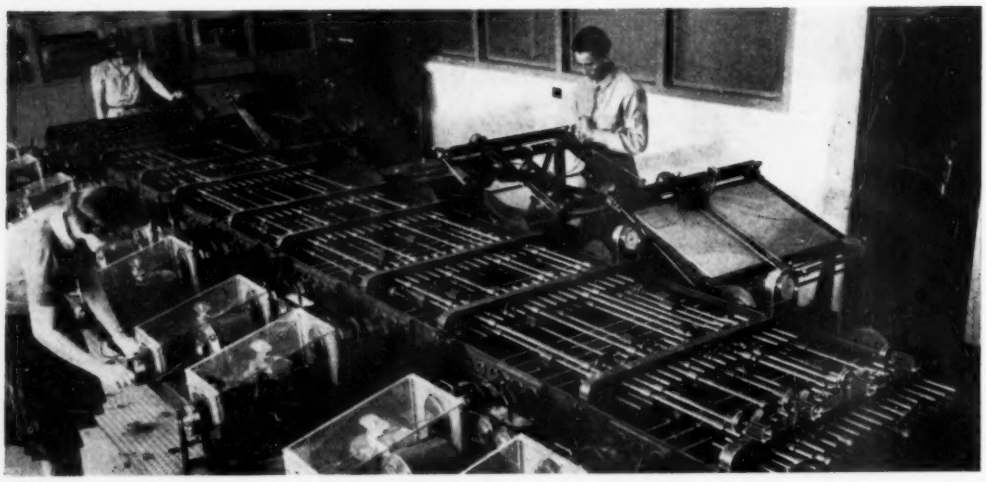
The many departments of the Laboratories render otherwise unavailable services in the fields of interior, exterior, and terminal ballistics, instrumentation for ballistic measurement, computing techniques, ordnance engineering, and quality control.

The best of obtainable equipment is supplied to the Laboratories, such as the wind tunnels used for testing models of guided missiles, supersonic aircraft, bombs, and projectiles for the other departments of the armed forces. To keep pace with the changing times, a constant refinement of the facilities that are required in any field of research is a permanent policy at Aberdeen.

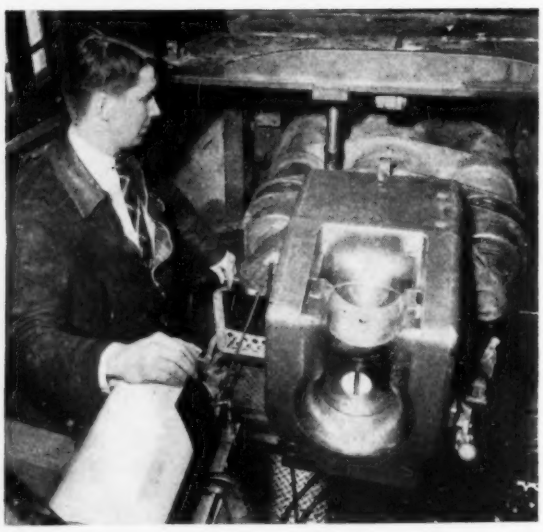
The unrelenting search for new or greater knowledge by the men of the Ballistic Laboratories has assumed a deeper significance with the passing of years. Their contributions to the strength of our country cannot be measured quantitatively. But their work is an affirmation of the belief that any moral nation having the industrial capacity to make superior weapons, evolved by research, in any required quantity, can enjoy the blessings of a secure peace.



This cathode ray oscillograph equipment is used to record quantitatively the ballistic phenomena occurring in short periods, such as gun barrel pressures.



The ballistic camera control room, above, records the position of missiles with respect to time. Left, the differential analyzer is a device used for the integration of systems of ordinary differential equations. It computes the paths of shells and bombs in addition to other ballistic problems.



The displacement-time recorder is set up to determine the recoil speed of a gun when it is fired.

Various types of photographic records are placed on this contour projector, enlarging them for measurement.

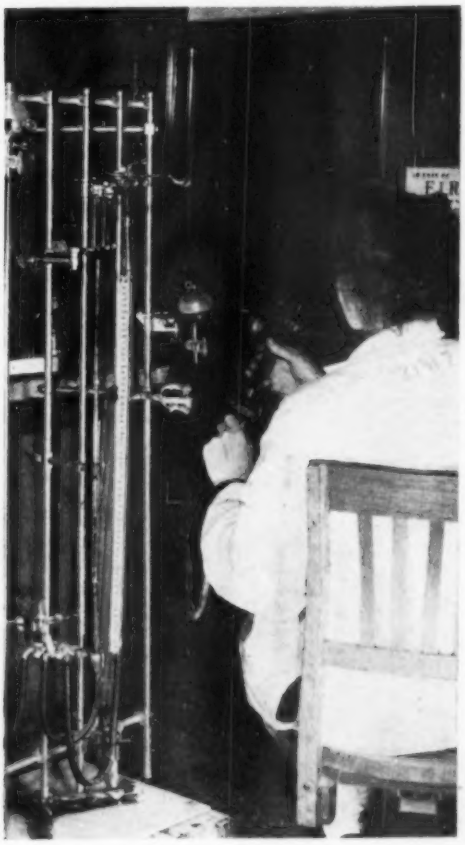
ocket to be studied in the wind tun- scaled down to exact proportions.

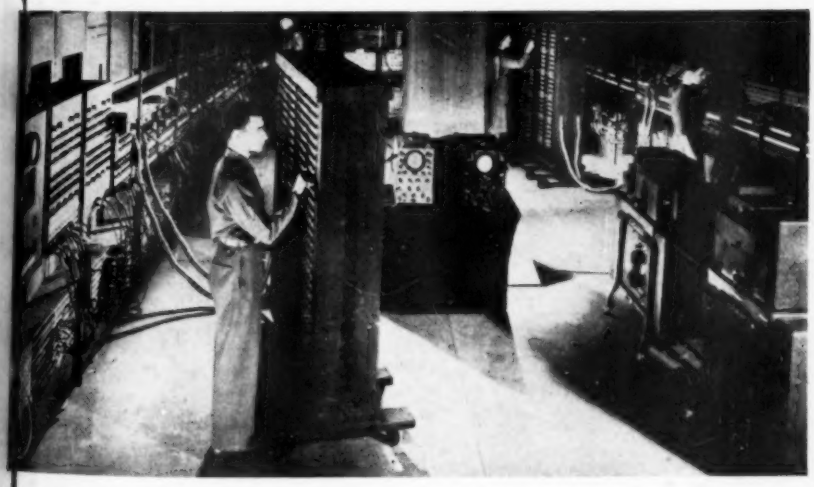
Air pressure in the supersonic wind tunnel is measured and controlled by this flow regulator.

This technician is measuring the diffusion rate of gas through a film of propellent powder.

The Ballistic Research Laboratories. Working in this modern structure are experts who have devoted their lives to special phases of ballistics.

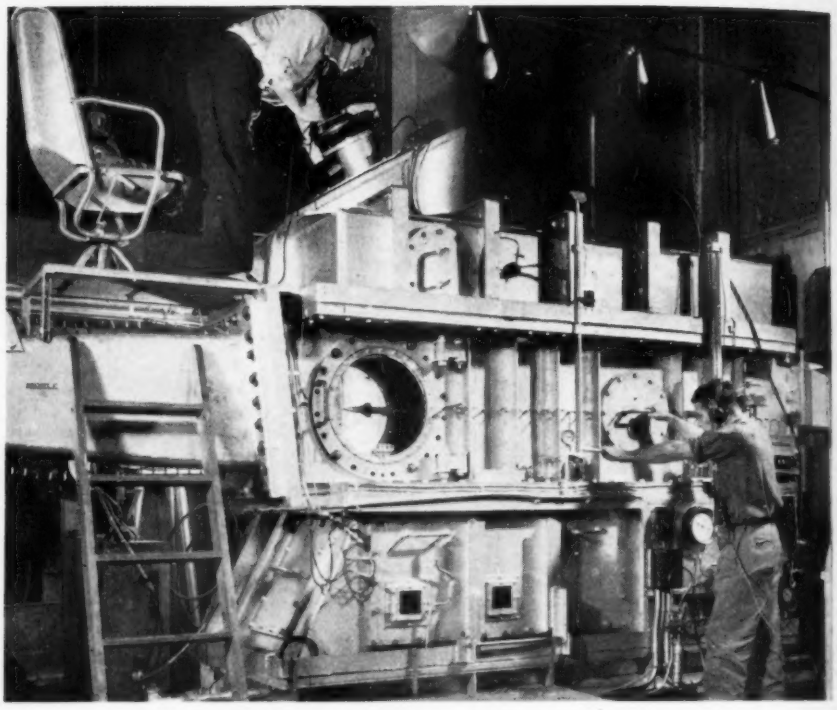
Skilled technicians do much of the lab work, such as analyzing propellent powder.





AC electronic brain was designed to compute highly complex mathematical prob- ly. It shows its speed by multiplying two 10-digit numbers in 1/300th of a second.

The seven eminent scientists here, members of the Laboratories' Advisory Board, are, left to right: Dr. A. W. Hull, General Electric Company; Prof. H. N. Russell, Princeton University; Prof. I. I. Rabi, Columbia University; Dr. Bernard Lewis, U. S. Bureau of Mines; Prof. G. B. Kistiakowsky, Harvard University; P. L. Alger, General Electric Company; Prof. H. C. Urey, University of Chicago. Two hold the Nobel Prize.



Much of the Laboratories' work in supersonics is done with this wind tunnel. Models of missiles, mounted inside the circular window, are subjected to a stream of air traveling at supersonic speed. By changing the model's aspect to the airflow its behavior can be studied and the construction and performance of the life-sized missile can be accurately determined.

Known as "Little Bright Eyes," this instrument is a 4½-inch tracking telescope mounted on an M45 machine-gun turret. Now in operation at White Sands Proving Ground where the Laboratories have instrumented many of the projects, the telescope has been successfully used to observe the flight of rockets as they thrust their way into the stratosphere at great speed.

Air Power in Total War

Thoughts on the Devastation of German Cities

by

Leo A. Codd

Passive defenses afford some protection, but there is no real escape from an enemy who dominates the air

YOU can stand in any one of a thousand places in the larger cities of Germany and, as far as the eye can see, there is nothing but ruin. Many of these areas will not be rebuilt for generations—if they are rebuilt at all. This devastation is the result of pin-point and area bombing—the former practiced initially by our day-flying Army Air Force, the latter mostly by the British night-flying Royal Air Force. Both were striving for a knockout blow. All was in retaliation for the blitzkrieg, the horror bombings by the German *Luftwaffe*.

Words and photographs are inadequate to describe the degree of damage that has been done to European culture in all the countries where total war from the air was waged. I had an opportunity to see and study much of it 2½ years after the bombs had stopped falling. You must see it yourself to appreciate adequately its totality. Even then you will find difficulty, as I did, in grasping the full import of total air war—for it is nothing less than the threat to our Christian culture and civilization the world over.

It's time that some one demand the cessation of total war on moral grounds, for all other appeals fall on deaf ears. Since the theological and religious leaders seem to fear discussing the unmorality of total war it may not be amiss if this magazine of scientific and industrial preparedness lead the crusade. Surely there is no greater cause to espouse, for it is the cause of survival of our civilization.

Tonnage of bombs (short tons) dropped on Axis Europe by Strategic Air Forces (U. S. Eighth and Fifteenth Air Forces and R.A.F. Bomber Command) October 1944 through April 1945:

TARGETS	TONNAGE
Area raids	317,642
Oil production and storage	192,714
Ordnance plants, tank factories, motor vehicle manufacturing plants, and explosives plants	24,031
Transportation facilities, railroad equipment manufacturing, and roundhouses	381,304
Aircraft production	12,382
Airfields	71,312
Miscellaneous	235,382
TOTAL	1,234,767

(From "The Effects of Strategic Bombing on the German War Economy," the United States Strategic Bombing Survey, October 1945.)

2,700,000 Tons of Bombs

First let us look at the cold figures on the bombing of our German and Italian enemies in World War II. I do not have the figures on the amount of bombing done by the Germans and Italians nor that done by the Russians. Our record and that of the British is most impressive, as the ruins one surveys throughout Germany so eloquently testify. The United States Army Air Force and the Royal Air Force dropped a total of 2,700,000 tons of bombs on Europe. This was the work of nearly 28,000 combat aircraft and of 1,335,000 men assigned to combat commands.

The greatest cost to us was 79,265 American airmen lost in action. The British losses were a shade greater, 79,281. The greatest losses by the enemy were 250,253 German civilians killed, 305,455 seriously injured. The allied air forces destroyed or heavily damaged 3,600,000 dwelling units—nearly one-fifth of all the dwellings in urban and rural Germany.

Considering the great damage, the sudden attack, the conflagrations—it is certain that many listed as missing were killed. It has been reliably estimated by the American Strategic Bombing Survey that total deaths reached 305,000; the number wounded has been calculated to have been 780,000.

To appraise the cost to ourselves in material and in effort ponder these figures:

There were more than 1,440,000 bomber sorties and 2,680,000 fighter sorties flown against the enemy. The cost in dollars to the United States for its part in the air war in Europe was more than $43,000,000,000. There were about 57,000 German aircraft destroyed in combat and on the ground.

Looked at from another angle these statistics are revealing. The distribution of bomb tonnages (2,700,000) dropped was 50.3 per cent on Germany; 21.8 per cent on France; 13.7 per cent on Italy and Sicily; 6.7 per cent on Austria, Hungary, and the Balkans; 7.5 per cent on other countries.

The principal types of targets and the percentages of bombs dropped on

This is the third of a series of articles by the Editor of ORDNANCE dealing with the situation in Germany. By invitation of the Secretary of the Army, Kenneth C. Royall, and the Military Governor of the American Zone in Germany, Lieut. Gen. Lucius D. Clay, the author of these articles recently visited the American Zone and subsequently the British Zone. He also visited England and France.

The first of this series, "Another Report on Germany," was published in the January 1948 issue of THE COMMON DEFENSE, the monthly Washington newsletter of the American Ordnance Association. The second of the series, "Bombs versus German Industry," was published in the March-April issue of this journal (Vol. XXXII, No. 167, p. 318). The concluding article of the series will be published in the next issue of this magazine.

them were: land transportation, 32.1 per cent; industrial areas, 23.7 per cent; military targets, 11.1 per cent; oil, chemical, and rubber facilities, 9.3 per cent; airfields and airdromes, 6.9 per cent; naval and water transportation, 4.2 per cent; V-weapon launching sites, 2.0 per cent; aircraft factories, 1.8 per cent; miscellaneous manufacturing targets, 2.6 per cent; all other targets, 6.3 per cent.

Damage by Incendiaries

It is the damage to cities that is the most appalling. As one stands at the Brandenburg Gate in Berlin the destruction in every direction for a distance of 3½ miles is said to be 97 per cent complete. It is estimated that Berlin is 60 to 70 per cent destroyed, and three-fourths of that destruction was by fire. Ton for ton, incendiaries were 4.8 times as effective as high-explosive bombs in causing damage in residential areas.

Terrific fire damage was done in Hamburg, Kassel, Darmstadt, and Dresden. It has been said that in Hamburg 2 out of 3 buildings were afire within 20 minutes over a 4½-square-mile area as a result of incendiary bombing.

The series of attacks on Hamburg occurred during July and August 1943 when 55 to 60 per cent of the city was destroyed, 12½ square miles completely burned out, 300,000 homes ruined; 750,000 people made homeless, and between 60,000 and 100,000 persons killed. These were the results of both high-explosive and incendiary bombardment.

It was the theory of the Air Force, substantiated in fact, that high explosives not only did great structural damage but also kept the fire fighters under cover until the incendiaries made real headway. In Hamburg, seventy-five to eighty per cent of the damage was due to fires.

And so one might recount, city for city, the cold statistical data of the destruction wrought by air power in total war. Most of the figures cited above—and many, many more—are objectively presented in, and their use here is gratefully acknowledged to, the over-all report of the United States Strategic Bombing Survey under the chairmanship of Franklin D'Olier. The report was published in September 1945. I saw much of the area included in the survey but two years later. Little, if any, of the damage had been repaired—a store front here, a mansard there. But the great cities of Germany have been laid low, and it is doubtful that the burnt-out hearts of them will be rebuilt in another generation, if ever.

This then is the meaning of air power in the age of total war. It means the annihilation of cities, the seats of culture. It means the destruction of churches, schools, museums, hospitals, asylums, homes, and theaters, in addition to manufacturing plants, transportation systems, powerhouses, and bridges. What is the meaning of it all and where does it lead us in a world that strives for peace?

The conclusions are as simple as the destruction of Europe is stark. The immediate solution is an American fighting force—land, sea, and air—so overpoweringly strong and so preponderantly backed by science and industry that any tyrant foolish enough to attack us or our interests will be subject to instant and overwhelming counterattack. That is simply the application of the first law of nature—self-preservation.

Nowhere in Germany does one see the effects of more powerful explosives than TNT, RDX, and the others used in World War II. What applies to their use applies with greater future import to atomic explosives.

Rearm with Determination

Pity though it be, if we must arm again just as we had thought we were to enter upon a long era of peace, then let us rearm with determination. Let us bring our land, sea, and air forces to full strength in trained men with superior ordnance in adequate quantity. And let us use that strength without hesitation whenever and wherever the rights of our citizens and those under our protection are attacked. And let us remain in that posture of readiness until the last vestige of discord and aggression has vanished.

If that be a hundred years, so be it; for "the right is more precious than peace, and we shall fight for the things which we have always carried nearest our hearts, for democracy, for the right of those who submit to authority to have a voice in their own governments, for the rights and liberties of small nations, for a universal dominion of right by such a concert of free peoples as shall bring peace and safety to all nations and make the world itself at last free."

Then will be the end of total war, and then possibly will the moralists speak out as they now seem afraid to do. For it is intrinsically wrong to slaughter noncombatants, the aged, the young, the invalid, the mother and child. Woe to the Nazi terror that brought this scourge upon the earth and woe to the adversary that was forced to retaliate. Once the world returns to sanity in its international relations one of the first codes of law to be rewritten should be that which outlines the use of air power in war. But first, a basis of fair dealing must be restored. Until then our only hope is the strongest Air Force, the strongest Army, and the strongest Navy in our hands—the hands of the most peaceful nation!

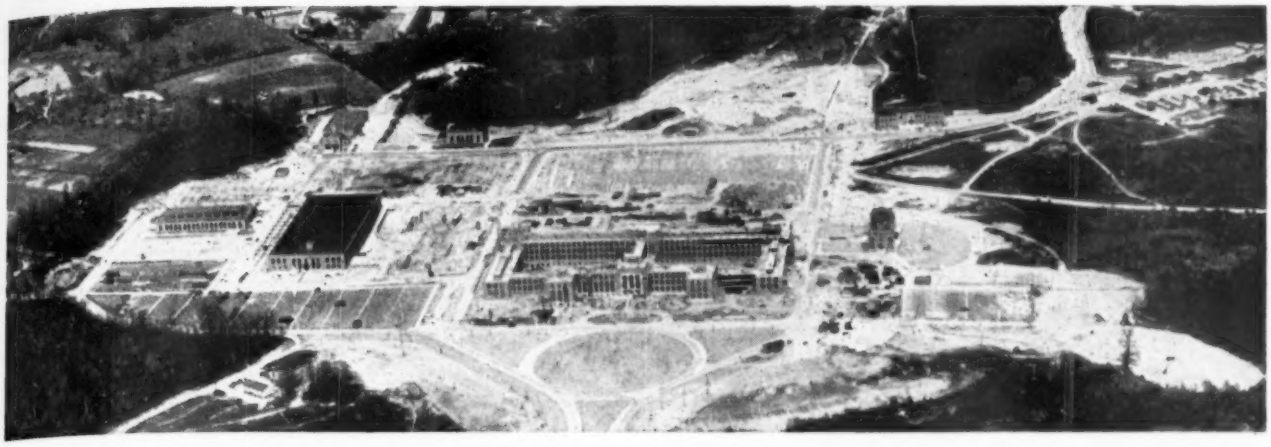
A SIGNPOST

"As the air offensive gained tempo, the Germans were unable to prevent the decline and eventual collapse of their economy. Nevertheless, the recuperative and defensive powers of Germany were immense; the speed and ingenuity with which they rebuilt and maintained essential war industries in operation clearly surpassed allied expectations.

"Germany resorted to almost every means an ingenious people could devise to avoid the attacks upon her economy and to minimize their effects. Camouflage, smoke screens, shadow plants, dispersal, and underground factories were all employed. In some measure all were helpful, but without control of the air none was really effective.

"Dispersal brought a measure of immediate relief but eventually served only to add to the many problems caused by the attacks on the transportation system. Underground installations prevented direct damage, but they, too, often were victims of disrupted transportation and other services. In any case, Germany never succeeded in placing any substantial portion of her war production underground—the effort was largely limited to certain types of aircraft, their components, and the V-weapons.

"The practicability of going underground as the escape from full and free exploitation of the air is highly questionable; it was so considered by the Germans themselves. Such passive defenses may be worth while and important, but it may be doubted if there is any escape from air domination by an enemy."—*The United States Strategic Bombing Survey.*



The Naval Ordnance Laboratory

Expanded Facilities Meet the Challenge of Modern War

by

Dr. Ralph D. Bennett

Explosives, influence fields, supersonic aërodynamics, and infrared light are under particular investigation.

THE extent to which the various bureaus of the Navy engage in research and development depends considerably upon the extent to which the equipment they use has nonmilitary applications which encourage its industrial development. Since most ordnance equipment has no industrial use, the Navy Bureau of Ordnance finds it necessary to carry on research and development in its own laboratories and test stations on a large scale.

The Bureau now has in operation, in addition to its older facilities such as the Naval Proving Ground at Dahlgren, the Naval Gun Factory, and various other naval ordnance plants, two large research and development organizations —the Naval Ordnance Test Station at Inyokern, Calif., and the Naval Ordnance Laboratory at White Oak, Md.

The Naval Ordnance Laboratory stems from two lines of development. The first has to do with fuzes and goes back more than one hundred years to the work of Dahlgren in the Washington Navy Yard. The second is concerned with mines and goes back to the successful use of moored mines in the North Sea barrier in World War I. These two lines of development were combined, largely through accident of circumstance, in a small laboratory in the Washington Navy Yard. In 1929, the combined establishment was named the Naval Ordnance Laboratory.

Operated Under Handicaps

This laboratory continued to operate under many handicaps through the slim years of the 'thirties. To the men who carried the torch through those difficult times belongs the credit for development of most of the contact fuzes used by the Navy and the availability of a supply of moored mines which proved of great defensive value in World War II.

The use of magnetic mines by the Germans in 1939 produced an immediate and critical need for defensive measures. The problem of developing methods for building protection against these mines into the ships of the Navy and Merchant Marine was presented to the Laboratory in December of that year. The magnitude of this problem induced a very great expansion of the establishment. Its personnel complement rose from less than 50 in 1939 to nearly 1,000 by the time the war officially started and to twice that number by the time hostilities ended.

Building on the aid furnished by the British Admiralty, the Laboratory very largely solved the research and development phases of the degaussing problem by December 1941. It was then able to devote its major effort to the offensive phases of mining and developed a line of mines which proved highly effective against the ships of the Japanese Empire.

The Laboratory also became involved in the development of proximity torpedo exploders for which it was well fitted because of its experience in proximity mine firing devices. It continued to carry the primary responsibility in the Navy in the development of contact fuzes for bombs and projectiles.

New Buildings

The Naval Ordnance Laboratory found, even as many industrial enterprises had discovered before it, that the environs of a production plant were not conducive to effective prosecution of research and development. In 1943 it took steps to provide plant and buildings for an independent establishment whose primary objective would be research and development, unhampered by the requirements of production or other unrelated considerations.

Construction of this plant is approaching completion. Further, reconversion of the Nation's research and development facilities has brought to the Laboratory a great variety of prob-

Dr. Bennett is technical director of the Naval Ordnance Laboratory. The illustration above shows the new laboratory site and some of the buildings now under construction.

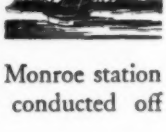
lems in fields of activity widely different from those in which it had engaged during the war.

Where it can be accomplished efficiently and competent and interested contractors can be found, the Bureau of Ordnance has its research and development undertaken by universities and industry. The share of the remainder allotted to the Naval Ordnance Laboratory depends on available facilities and talent. The Laboratory is continuing its work in underwater ordnance and still carries on the main research and development for the Navy's mine program.

The development work of the Army in submarine mines is now carried on by one of its own groups working within the Laboratory, and the interests of the Air Force, represented by a liaison officer, are continuously considered. The Laboratory remains as the primary source of development in torpedo exploders and is also involved in the administration of the development by industry of certain new types of propulsion.

Testing Programs

An elaborate laboratory and field testing program is conducted to make sure that the Laboratory's products will stand up in service. To implement this program the Laboratory maintains a field test station at Hiwassee Dam, N. C., where tests can be made on weapons which require deep water. The Mine Test Station at Solomons, Md., now under jurisdiction of the Laboratory, carries out a variety of tests on many kinds of weapons in Chesapeake Bay. The Fort Monroe test station, operated jointly with the Army, provides means for measurements on the great variety of shipping passing into and out of Hampton Roads, and, finally, the rough-water test station formerly at Provincetown is now being consolidated with the Fort Monroe station with operations being conducted off Cape Henry.



Recognizing the depletion of results of basic research, the Laboratory has organized a research department which is engaged in some of the more basic phases of investigations of principles which are likely to have application in ordnance, particularly explosives, influence fields, supersonic aërodynamics, and infrared light.

The new White Oak plant of the Naval Ordnance Laboratory is located twelve miles northeast of the center of Washington and covers nearly a thousand acres, most of which were wooded when the Laboratory took over. The central structure, now nearing completion, is a combined administration and laboratory building comprising four units. It will have the most modern type of construction including movable partitions, ducts for the provision of laboratory services to any part of the building and for suitable interconnection between rooms, modern lighting, air conditioning, and fireproof construction. There is a model shop, equipped to do all but the heaviest machine work, which has sections for handling sheet metal, welding, electroplating, and heat treating in addition to the usual machine-tool procedures.

"There is no reason to believe that it will be possible to relax our vigilance in world affairs in the near future. As long as this condition prevails, the efforts of the Naval Ordnance Laboratory and of similar institutions will be very necessary to our national security."

The Naval Ordnance Laboratory remains the most important source of magnetic work for the Navy. To carry this on, a group of small buildings was provided free of iron and built of materials with unusually low magnetic properties. These buildings are equipped with coils of many varieties which, with their central power supply and elaborate control mechanisms, can be made to simulate the magnetic experience of a mine or torpedo exploder at any depth under a ship of any size moving at any practical speed on any desired heading at any point on the surface of the earth.

Research in Explosives

Research in explosives in its preliminary phases can be carried out with very small charges. Sufficient area is available on the White Oak station to make tests with charges of this size without producing undue annoyance to the neighbors. Suitable press, mixing, casting, assembly, and surveillance buildings are being provided together with bombproofs, observation buildings, and test equipment.

For reasons of economy, field testing is reduced to a minimum wherever possible by the simulation of such tests in the laboratory. For example, for the field of ordnance handling a mechanical test building is being provided which will house pressure and vacuum tanks, low- and high-temperature rooms, vibration equipment, and shock-test gear. In addition, there will be provision for many varieties of nondestructive tests.

The German wind tunnel captured at Kochel, Bavaria, is being redesigned, modernized, and reërected at White Oak. This wind tunnel will have a higher range of Mach numbers (going up to 8.9) and a bigger variety of nozzles (80 x 80 cm. under consideration; 40 x 40 cm., 18 x 18 cm. under construction) than any other tunnel now under construction in this country. Starting with the experience and know-how which the Germans possessed at the end of the war, and with very substantially improved equipment, this tunnel should contribute much toward this country's advance in the field of supersonic aërodynamics. This facility will be shared with the Army, the Air Force, and with industry up to its maximum capacity.

Superior Talent Needed

It has long been recognized in the Naval Ordnance Laboratory that, because of the dependence of progress in research and development on the individual enterprise and ability of the staff members, the provision of superior talent is a most vital problem in its operation. To implement this recognition, the management of the Laboratory, with the hearty support of the Bureau of Ordnance and the cordial coöperation of the Civil Service Commission, has been engaged in efforts to improve the competitive position of the service laboratories with respect to the acquisition and retention of scientific and engineering talent.

The Bureau of Ordnance has been a leader in the recognition of the value of military-civilian teamwork in military research and development. It has recognized that the efforts not only of the military profession but also of many others are necessary to produce a successful weapon.

There is no reason to believe that it will be possible to relax our vigilance in world affairs in the near future. As long as this condition prevails, the efforts of the Naval Ordnance Laboratory and of similar institutions will be very necessary to our national security.

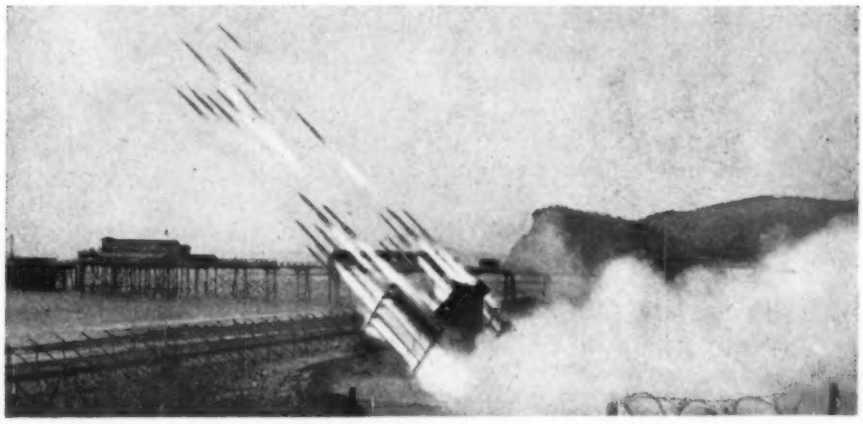
Genesis of the War Rocket—Part II

The Growth of Rocket Ordnance

by

F. W. F. Gleason

The revival of the war rocket in modern times served to emphasize the great potentialities of this spectacular weapon



Rocket guns were used by the British against aircraft during World War II.

GENERAL Congreve's death, May 16, 1828, marked the end of the 6-century record of the war rocket's first phase. Though his rockets were in use by the British services until 1846, they were in little favor. As early as 1829, Lieutenant Beauchant stated in "The Naval Gunner" that the 32-pounder, launched from ship's boats, was inaccurate at 1,500 yards (normal range); also that rocket service was much disliked as "rockets had been known to explode in the boat's discharger." It was evident that the loss of Congreve's enthusiasm and influence, rather than the moderate improvement in the smooth-bore gun was responsible for the swift decline in the rocket's popularity.

In the United States, Lieut. Col. G. Talcott mentioned trials of rockets at the Washington Arsenal (site of the present War College) in 1839. And in 1840, the Ordnance Department reported that machines were ready to manufacture rockets but that the work awaited decision as to the exact model to be produced.

About this time improved methods greatly speeded up the loading of rockets and improved the propellent charge. The mallet and wedge, used in manual loading, gave way to the hydrostatic press and power drill.

The second phase of the war rocket's history opened in 1846 with the production by William Hale, at Woolwich, of the spin-stabilized rocket which bore his name. The first of the type employed tangential holes at the periphery of the base to produce spin. Soon, three curved vanes or flanges were added, increasing the spinning power of the propellent gases. These Hale rockets were of 6 and 16 pounds' weight, and both sizes had a range of 2,200 yards.

The new type was shortly brought to the attention of the U. S. War Department. Samples were obtained from England and tested at Washington Arsenal and, in December of 1846, the U. S. purchased manufacturing rights to the Hale rocket, paying $2,000 at once with $18,000 additional when further tests (of American-made rockets) proved satisfactory.

Used at the Front

Commendable energy was shown by the War Department in getting the new weapon into use at the front. The Mexican War had been in progress several months, operations were rapidly expanding, and, on December 28, 1846, the Ordnance Department created, at Fortress Monroe, a battery armed with rockets and with mountain howitzers.

Lieut. Gen. Winfield Scott, commanding the forces massing for the Vera Cruz campaign, formally approved the suggestion that a rocket troop be sent to join his army. A specially recruited unit of one hundred Ordnance troops was equipped with six rocket dischargers from Fortress Monroe and six light-barreled, 12-pounder mountain howitzers. The combination proved successful.

Shortly after joining Scott, the troop participated in the bombardment of Vera Cruz. We do not know how many rockets were among the 6,700 projectiles fired by U. S. troops in the action, but the Chief of Ordnance reported that by late 1847, 1,328 had been issued to the troop. A month after Vera Cruz their rockets again fell in Mexican ranks at the smashing victory of Cerro Gordo.

For the next five months the rocket-howitzer troop was with the main body of the army which bitterly fought its way to Mexico City. It actively participated in the battles of Contreras, Molino del Rey, and Chapultepec. After the occupation of the capital had ended, the troop was mustered out of service in 1848.

Despite the record of usefulness which the Hale rocket had made, it shared in the usual postwar letdown common to all ordnance. However, the War Department seems to have made considerable effort to keep up with new rocket developments. In 1851, William Hale, Jr., brought to this country an improved launcher that was purchased by the Government. Ordnance Department Regulations of 1852 listed two sizes of Hale rocket as well as the Congreve. These latter seem to have been in reserve and by 1862 were no longer listed.

Mr. Gleason is an ordnance historian and a student of military affairs.

Again, in 1855, a Robert Hale brought further improvements which were used at Washington Arsenal—the patent rights costing the Government $5,000. The improved rocket was doubtless that mentioned in Scoffern's "New Resources of Warfare" published in London in 1859. Sometimes called the "rifled rocket," its case was divided by an iron diaphragm, the powder in the rear compartment furnishing the propellent force and that in the upper chamber supplying the power for rotation.

On the outbreak of the Civil War a rocket battery was organized for service with the Union Army. Known as the 24th Independent Battery, New York Light Artillery, U. S. Volunteers, the battery was formed at Albany in 1861.

On reaching Washington later that year, months were spent in waiting for the rockets and dischargers, which arrived in March of 1862. The rockets were of two sizes—2½-inch and 3-inch diameter. The dischargers, described as "breech-loading fieldpieces with a range of 5,300 yards" were, for the 2½-inch rocket, a wrought-iron tube 8 feet in length, perforated over its entire surface with one-inch holes. The 3-inch discharger was formed of ¾-inch wire, spirally coiled.

At first all were mounted on tripods, but plans were made to mount four on each conventional gun carriage—giving sixteen rockets to each discharge of the battery. All rockets were of the spin type, rotated by gas from tangential nozzles.

Tests

The trials of the new equipment were conducted just outside Washington. Officers and men were enthusiastic, calling the results "perfect," though one man—after the war—records an amazing dissent; he states that after nearly all of the rockets were expended "they were voted a failure." It is one of the many contradictory afterthoughts which crop up in historical research. The record, however, seems clear enough. Accuracy, though not equal to rifled guns', was satisfactory. Range was, for that time, phenomenal—the coiled-wire discharger sending its 3-inch missile more than three miles down the Potomac. Yet, one week later, rockets and dischargers were stored, never to be seen again. The 24th Independent Battery was equipped with 3-inch rifles and served through the war as a battery of conventional artillery.

Benton's "Ordnance and Gunnery" of 1861 states that "the difficulties in achieving the necessary exactness in manufacturing rockets and the even greater difficulty in storing and transporting them without injury to the powder composition renders their use as a weapon of war . . . exceedingly troublesome."

This would seem to be the chief explanation for the strange failure to use the rocket in the Civil War. That not even one 4-gun battery, already equipped with this weapon and trained in its use, could be spared for experimental work with this weapon of opportunity in improved form is a sad commentary on the military imagination of the time.

An Early "Bazooka"

Even civilian experimentation found good use for the rocket while the war was in progress. In *The Merchants Transcript* of April 8, 1865, appeared a New York manufacturer's advertisement of "Rocket Harpoons and Guns" such as "were used by the bark REINDEER in 1864." The accompanying woodcut (reproduced below) shows a launcher being fired from the shoulder. Amazingly enough, it is actually a 5-foot "bazooka" of some 4-inch bore and is fitted with a face shield. It is not difficult to imagine the tremendous value of such a powerful, mobile weapon in the trenches of Vicksburg (where desperate Unionists improvised wooden mortars to send shells into near-by Confederate bastions), Spottsylvania, and Petersburg. (And many of us thought the bazooka was an invention of World War II!)

While the United States had thus toyed with the war rocket—using it with success in the small but brilliant campaign in the Valley of Mexico and rejecting it in her great civil conflict—the weapon had enjoyed a somewhat steadier course among the various nations of the Old World. Besides Britain, twelve European countries had incorporated rocket troops into their armed forces. Little reliable record remains of most of them.

The Austrian Rocket Corps is the outstanding exception. It was consistently treated as an independent unit. An *esprit de corps* was built, men knew just what their weapons would do, and, most important of all, a tactic for the use of the rocket was developed by experience. The corps boasted a long line of victorious actions in Hungary and Italy. In all of these the incendiary war head was replaced by the much more destructive case shot and shell.

But in 1866, during Prussia's Seven Week's War on Austria, the performance of the Rocket Corps was "considered unsatisfactory." The quite novel rockets used in this conflict were very destructive but of only 300 to 400 yards' range. A very heavy war head—of greater diameter than the rocket—was fitted loosely to the case and separated from it at or even before the end of the high-angle, mortarlike flight. The launchers were muzzle loading.

Sharing in the debacle of the Austrian forces, the Rocket Corps evidently made a convenient scapegoat. In any event, it was permanently dissolved the following year. Coming at a critical point in the war rocket's fight for survival, it doomed it to a virtual oblivion that was to last for seventy years.

During this period of quiescence both experiment and use showed that

PATENT ROCKET HARPOONS AND GUNS.
FASTEN TO AND KILL INSTANTLY WHALES OF EVERY SPECIES
WITH PROPER LINES AND BOATS,
SUCH AS WERE USED BY THE OFFICERS OF BARK REINDEER IN 1864,
ALL WHALES ARE SAVED.
N. B.—Two Months' notice required to fill an Order for the Season of 1866.
FOR SALE BY
G. A. LILLIENDAHL, - - - - - - - - - NEW YORK

Courtesy Maj. B. K. Lewis, Ord. Dept.

This ad from the *Merchants' Transcript* of August 8, 1865, shows a rocket launcher closely resembling the bazooka.

the idea of the rocket weapon was not entirely dead. But for the great bulk of men it was not only dead—it had never existed! Even in the land whose national anthem commemorated the "rockets' red glare," it was the concensus that the reference was to the signal rockets of the British fleet. At least one modern American historian records the use of rockets at Bladensburg in words that intimate nothing else.

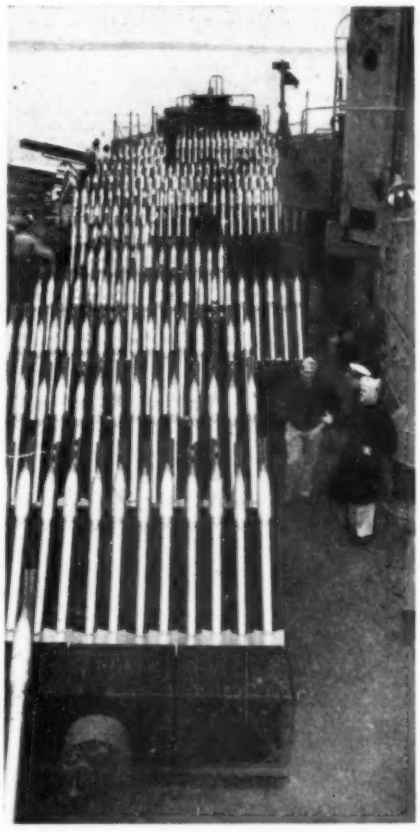
From 1862 to 1879 there were several interesting experiments in America and Britain in the field of underwater rocket torpedoes. They were taken up by the German Navy in 1906 and continued for at least five years. The occasional erratic course taken by these rocket torpedoes caused the attempts to be abandoned. Superior accuracy of the Whitehead mechanical torpedo has to date prevented use of the underwater rocket, though its tremendous speed potential may still be sought.

The First World War would seem to have offered a fertile field for the use and development of such a mobile, short-range weapon; but the rockets of that great struggle were so crude and their use so negligible that they were of little account. The Germans used their heaviest coast-guard rockets to project line-carrying grapnels over enemy barbed wire, and both French and Russian planes wired rockets to their struts in order to set fire to observation balloons.

Some little experimental work on the war rocket was done in the years preceding World War II, though the combined outlay for all countries for 1929-1939, was under $150,000. It is significant that virtually every military use proposed by the experimenters of the 1930's became reality during the war. And in the Spanish Civil War of 1936-1939, a significant proving ground for ordnance and ordnance tactics, the Nationalists besieging Madrid fired 11,000 large rockets into the city. The "war heads" of these missiles were tin cans containing tissue-paper propaganda leaflets.

The most valuable of the rocket experiments of the prewar years was begun in 1934 in Britain. This was carried on under the Director of Ballistic Research at Woolwich. By the spring of 1939, the new antiaircraft rocket, propelled by extruded cordite, was secretly tested in the British West Indies. Its manufacture began early in 1940.

The exigencies of the second World War were responsible for the speedy development and utilization of the war rocket in its third and greatest phase. When Hitler's blitzkrieg overwhelmed Western Europe and drove the British Army from Dunkerque, the bulk of that nation's artillery was lost, without hope of replacement for many months to come. Hardly 500 antiaircraft guns remained in the United Kingdom.



Literally covered with rockets, LST's of the Navy have tremendous firepower.

The situation, made even more critical by threat of air bombing, stimulated the War Office (some one must have been reading history on the sly) to immediate action. It was suddenly remembered that the rocket was both projectile and gun. The fact that it could be effectively launched from light, cheap, easily made tubes or frames made it an excellent stopgap weapon for the emergency. And that it could produce a veritable storm of fire (a point which Congreve never tired of emphasizing) made it a "natural" for use against attacking planes.

The "Z-Gun"

In the summer and fall of 1940, the Z-guns hurled thousands of rockets into the skies over Britain—contributing largely to the failure of the Luftwaffe's grim attack. This initial success assured the war rocket a place of increased importance in the war. Late in 1941, the Russian Stormovic (a low-flying attack plane) was launching 220-pound rockets at ground targets, and in 1942 Russian ground forces were employing the "Katyusha" multiple launcher.

Before long the Germans fell into line and the "Nebelwerfer" was hurling its six 50-pound rockets to a range of 6,000 yards and at a rate of 60 rounds a minute.

The United States joined the rocket-using nations at the time of the North African landings. The "bazooka"—a one-man tank killer—was a novel development among modern rockets, reminiscent of the hand-held bamboo launchers of eighteenth-century India. Later came our 4.5-inch fin-stabilized and spin-stabilized rockets, fired from single or multiple launchers; the 7.2-inch demolition rocket for short-range tank use; the 1,284-pound "Tiny Tim" which carried 150 pounds of TNT and was used at Okinawa; and others.

As the war progressed, new uses were found for the artillery rocket. British convoys were protected by rockets which released long steel tapes in the path of attacking planes. Antisubmarine as well as antitank and antipersonnel rockets were employed by planes. Navy craft used enormous quantities to cover troop landings. In 1944 the British had fitted an LST with 150 dischargers and claimed for it the "kick of thirty cruisers." The U. S. Navy, alone, reached an expenditure for rockets of $100,000,000 per month, and the Navy's estimate for 1945 was $1,000,000,000.

Beyond reasonable doubt the compelling factor which had hindered the development and use of the war rocket had been its easily damaged propellent charge of brittle, tightly packed powder. The solution of this difficulty was as simple as it was effective. Cruciform, somewhat flexible sticks of a mixture of guncotton, nitroglycerin, and restraining (slow-down) chemicals made a propellant which was proof against the shock and deterioration which was the nemesis of black-powder rockets.

Now that the rocket's greatest physical handicap has been largely overcome (it is still adversely affected by extremes of temperature) it is up to the ordnanceman and the ordnance organization to see to it that inertia does not prove to be the stumbling block in the future development of this weapon!

KEEP AMERICA STRONG

¶ This will be the theme and purpose of the Thirtieth National Meeting of the American Ordnance Association to be held under the auspices of its Michigan Post at Detroit and at Selfridge Field, Mich., June 9 and 10, 1948.

¶ The Technical and Scientific Sessions and the Thirtieth National Dinner Meeting will be held at the Book-Cadillac Hotel, Detroit, on Wednesday, June 9th.

¶ Demonstrations of equipment and tactics—land, sea, and air—will be held at Selfridge Field, Mich., on Thursday, June 10th.

¶ Invitations, reservations, and complete details have been sent individually to all members of the American Ordnance Association. Reserve these dates with the Ordnance Fraternity "To Keep America Strong."

Month by Month: A Review of the National Defense Situation

More Aircraft Urged

Peacetime production of military airplanes should be at an annual rate of 5,570 craft until peace is assured, the President's Air Coördinating Committee reported. The Committee called attention to the fact that it had made a similar recommendation in 1945, which was still valid. Production in 1947 totaled 1,800 planes.

Commenting that the 1945 recommendation of 5,780 planes was based on an assumption of a one-year warning of any critical emergency, the Committee declared there is no longer any certainty that planners may assume there will be a warning of that length of time in the future.

Representatives from the Departments of the Army, Navy, Air Force, Commerce and State Departments, as well as the Civil Aëronautics Board and the Bureau of the Budget are on the Committee which is the highest aviation policy group in the Government.

The Committee has become convinced that the serious situation existing in the aircraft industry jeopardizes our present and future national security.

Funds requested for military plane procurement in the fiscal year 1948 would provide only half of the production the Committee recommended in its 1945 report.

A question which the Committee wants settled in the coming year is the determination of the proper level for an aircraft manufacturing industry capable of meeting the peacetime military and civil requirements, and of prompt expansion to meet the country's defense needs.

The Committee stated that it is of the utmost importance that Federal policies and the Federal machinery to effectuate those policies remain constantly adjusted to the requirements of total air power.

It was the unanimous view of the Committee that prompt action is required to forestall further serious erosion of the aircraft industry's ability to serve as contemplated.

Army Field Forces

Secretary of the Army Royall announced on March 15th that Headquarters, Army Ground Forces, has been redesignated Office, Chief, Army Field Forces. The change involves not only the name but also the functions of the organization and seems designed to bring ground forces under the direct supervision and control of the General Staff.

The new office will be the field operating agency of the Department of the Army within the continental United States. It will have general supervision of all matters pertaining to the training of all individuals and units utilized in a field army. This will include Army combat, service, and administrative units, Organized Reserve Corps units, National Guard, and Reserve Officers' Training Corps units.

The six armies in the United States, formerly commanded by Army Ground Forces, will now be directly responsible to the Chief of Staff, U. S. Army. The commanding general of each of the armies and the Military District of Washington will command all units and installations within their area except those under the control of a chief of a service or another Department of the Army agency.

The Office, Chief, Army Field Forces, will remain at Fort Monroe, Va., where the headquarters of Army Ground Forces were located. Gen. Jacob L. Devers will continue as Chief, Army Field Forces.

Defense Message

In his address to the joint session of the House and Senate on March 17th, President Truman made three specific recommendations to meet the international crisis. A digest of these recommendations follows:

"1. I recommend that the Congress speedily complete its action on the European Recovery Program. That program is the foundation of our policy of assistance to the free nations of Europe. Prompt passage of that program is the most telling contribution we can now make toward peace. Time is now of critical importance. I hope that no single day will be lost.

"2. I recommend prompt enactment of universal training legislation. Until the free nations of Europe have regained their strength, and so long as Communism threatens the very existence of democracy, the United States must remain strong enough to support those countries of Europe which are threatened with Communist control and police-state rule. Universal training is the only feasible means by which the civilian components of our armed forces can be built up to the strength required if we are to be prepared for emergencies.

"3. I recommend the temporary reënactment of selective service legislation in order to maintain our armed forces at their authorized strength."

There is no conflict, the President said, between the requirements of selective service for the Regular forces and universal training for the Reserve components. Selective service is necessary until the solid foundation of universal training can be established. Selective service can then be terminated and the Regular forces may then be maintained on a voluntary basis.

National Military Program

Secretary of Defense James Forrestal, accompanied by the Secretaries of Army, Navy, and Air, appeared before the Senate Armed Services Committee on March 18th.

The Defense Secretary said that in considering the measures which must be taken without delay in order to establish a military policy commensurate with our national responsibilities, the two principal aspects to be considered consist of a long-range program and a short-range program. The long-range program embodies those measures which can be attained only by instituting action now.

Mr. Forrestal gave four reasons as the military justification for Universal Military Training:

1. It would provide the National Guard and the Organized Reserves with the necessary numbers of men which they cannot otherwise obtain by voluntary means.

2. It would provide them with men trained to a sufficient degree of proficiency to make the civilian components an effective force—a degree of training which cannot be obtained through the present voluntary means alone.

3. It would create a training plant

adequate to meet the demands of full mobilization without costly delay.

4. It would provide a foundation of trained man power for civilian defense in the event of emergency.

Turning to the immediate needs and to why temporary Selective Service legislation is necessary, Mr. Forrestal asserted that the pressing needs of the Regular Establishment for man power cannot be filled through voluntary enlistments. Despite the most successful volunteer recruiting program in the history of the world, our forces are today approximately 350,000 below the strengths which were set nearly two years ago.

By way of summary, Mr. Forrestal said that the enactment of UMT now will create a progressively increasing military strength in the future. Hence it will fill a continuing but long-range need. That need is to attain adequate military strength at the lowest cost consistent with our responsibilities as a nation.

But UMT will not fulfill the compelling and immediate short-range needs for adequate Regular forces in being. These latter needs can be met only through a limited Selective Service.

Air Force Strength

The United States Air Force in March reached the 312,000 enlisted-strength ceiling set by President Truman's budget message to Congress.

In the same month the Air Force lifted its former restricted-enlistment policy and resumed unlimited recruiting of unmarried men. Married men will be accepted if they qualify for assignment to the upper three grades or if they are USAF veterans reenlisting within ninety days of discharge.

In revising its enlistment regulation, the USAF retained all newly tightened requirements which eliminated enlistments with waivers for age and physical shortcomings. The USAF's aptitude test score requirement, now set at ninety and higher than any of the other military services, will remain unchanged.

The Air Force said it would profit by accepting every qualified applicant during the next several months to utilize existing training facilities to the maximum, because a reservoir of trained men was needed to balance heavy personnel losses expected in the fall when many of the earliest post-war 3-year enlistments expire.

The USAF's fiscal year 1948 budget, operative through June 30, 1948, provides for an enlisted strength of 337,000 men, and the Air Force now plans to utilize this authorization to build up its ranks against anticipated separations.

Officer strength in the USAF, set at 64,000 in the 1948 budget, now stands within a few hundred of the 48,000 recommended in the President's budget.

Dillon on Values

Col. L. J. Dillon, Ordnance Officer of the Sixth Army, recently addressed the California Apprenticeship Council in Los Angeles. Colonel Dillon was formerly executive officer to Maj. Gen. Everett S. Hughes, Chief of Ordnance.

In his remarks, Colonel Dillon stressed the following values that may accrue to our armed forces:

1. Regarding war plants available to the Army, the Nation is in much better shape than in 1939-1940. The fact that industry must go underground, in the event of another war, is recognized.

2. The Army is cognizant of the shortage of critical and strategic materials, and plans have been made for stock-piling and conservation while at the same time maintaining the proper balance of civilian and military economies on the highest possible level.

3. In 1939 Congress appropriated three million dollars for educational orders for the purpose of training industry in war production. This sum was later increased to fifteen million dollars. The present Congress has given certain limited amounts for industrial mobilization. At the present, however, there are no educational orders, although it is reasonable to assume that they will follow.

4. The Ordnance Department, as during the past fifty years, is training apprentices at its arsenals. The present program consists largely of veterans. Current experience indicates that the vast majority of Ordnance graduates remain in Government service.

Civilian Components

Secretary of Defense Forrestal has established a Committee on Civilian Components and has given the Committee a number of problems which he desires it to explore and study.

In general, Secretary Forrestal wants a comprehensive, objective, and impartial study of the type and character of civilian components that should be maintained; the missions which should be prescribed for such civilian components, the optimum size, composition, and organization of these components in order best to carry out such missions; the proper relation of such components to the several armed services and to one another; the ways in which the objectives desired may be attained with the maximum of harmony, efficiency, and economy; and the elimination of inequities and disparities among the several components.

The study will embrace such typical civilian components as the Naval Reserve, the National Guard, and the Reserve Officers' Training Corps.

In addition to Gordon Gray, Assistant Secretary of the Army, who is serving as chairman, the members are: Lieut. Gen. Raymond S. McLain, Assistant Secretary for Air John N. Brown, Vice Adm. William M. Fechteler, Assistant Secretary C. V. Whitney, and Brig. Gen. J. P. McConnell.

Nuremberg Trials

Nearly half of the members of Hitler's general staff and high command—111 generals in all—are alive and at large, with no definite evidence of war crimes charges pending.

About eighteen months ago the International Military Tribunal in Nuremberg decided against indicting the general staff as a criminal organization. Any members who have been tried since have answered to charges of specific crimes.

The record shows that twelve definitely have been sentenced for war crimes and eleven more are on trial now before United States military courts in Nuremberg. Several have cheated trials by suicide. One was acquitted, and one was excused from trial because of serious illness.

Only three to date are on record in Berlin as having been sentenced to death—Goering, Keitel, and Jodl. Six were sentenced to life imprisonment, and three others received terms ranging from ten to twenty-five years.

Of the entire 111, there is no information on only two—Adm. Wilhelm Meisel of the Naval War Staff, and Obergruppenfuehrer Felix Steiner, although the latter is thought to be dead.

Program For Peace

Bernard M. Baruch

TODAY the necessity is to keep war from starting. So terrible are the destructive potentialities of modern instrumentalities of war it is no longer good enough to punish an aggressor after he has begun a war. Preventing war requires buttressing our national security before the crisis is upon us. Never again do we dare permit our own lack of preparedness to encourage any potential aggressor into attacking this country or into overrunning other peaceful nations.

¶ It would be a tragic illusion, of course, to believe that military training, by itself, can prevent war. We should deceive ourselves by relying on any single measure of defense, on the atom bomb, on an air force, no matter how greatly augmented. All war has become total war. An adequate defense must be a balanced defense, with all its varied elements integrated into one whole.

¶ Supporting military training—even without military training—must be a ready-to-go plan for the full mobilization of our Nation. Such a program should be enacted into law now, with the understanding that it would come into effect by proclamation of the President with the concurrence of Congress.

¶ At different times, before other committees of Congress, I have outlined what such a mobilization plan should cover—a system of industrial mobilization with priorities, allocations, and rationing powers; a ceiling over all prices, wages, and rents to prevent inflation; taxation to take the profit out of war; the accumulation of strategic raw materials which may be lacking or in short supply; a work-or-fight wartime draft; the organization of pools of labor of all kinds and in all professions and sciences; intensified scientific research; expanded intelligence and information services; retention of war plants in stand-by readiness; the decentralization of industry to guard against an overconcentration which could be a strategic liability; up-to-date surveys of underground industrial facilities; uniform war contracts.

¶ Through the interwar years I repeatedly urged that such a program be placed on the statute books to be ready to function in case war came. It was not done. The result was a fumbling and faltering in the mobilization which unnecessarily lengthened the recent war, cost many lives, many extra billions. Much of our current inflationary troubles can be traced to the piecemeal price control law which was adopted when the war began, a law which legalized inflation.

¶ Prompt enactment of such a mobilization plan is made ever more pressing in present circumstances. When the last war broke out, a large proportion of our resources were not being fully utilized. Plants were idle; some millions were unemployed; there were sizable carry-over stocks of cotton and wheat. It was possible to start our mobilization for war by taking up this slack first and only later cutting into the normal civilian economy.

¶ Were war to burst upon us in the near future, the civilian economy would have to be drastically curtailed immediately. There is no slack today in materials, factories, food, labor, prices, in anything. Unless the Government were able to act quickly, with full mobilization powers, the confusion and inflationary havoc of sudden and full rearmament would be ghastly.

¶ The same threats which justify reënacting the draft and other measures require the immediate adoption of an economic mobilization plan which can be put into effect without delay. If we are to be prepared, it must be on all fronts.—*From a statement by Mr. Baruch before the Armed Services Committee, United States Senate, March 29, 1948.*

Michigan Post Sets Its Sights

New Plans To Cope with Postwar Problems Inaugurated

by

Robert L. Biggers

To carry out the objectives of the A.O.A. Post, a means to spread responsibilities among many busy men was found

THE Michigan Post of the American Ordnance Association covers in area the lower peninsula of Michigan. The industrial potential of this area justifies a sizable membership and reasonable activities in such important places as Lansing, Grand Rapids, Saginaw, Kalamazoo, and Ann Arbor in addition to the heavy concentration in the Detroit metropolitan area.

During the war years, memberships were easy to obtain and the Michigan Post total exceeded 5,900 members. Since that time, while many memberships have been renewed, the total has dropped to approximately 4,000. But, most important of all, little new blood has been added through new memberships of the younger men in technical and executive capacities who might be expected to hold responsible positions in industry in a future emergency.

The postwar problems of their own businesses have necessarily curtailed the amount of interest and effort that many previously active members of the Michigan Post could give to the Association. Therefore it was necessary to find some way in which we could get enough time from busy men to carry out the objectives of the Association.

To accomplish this, we have attempted to outline specifically the objectives which are considered possible and then to divide and allocate the responsibilities in small enough segments so that each individual can carry out his share without its becoming a burden.

I suppose we are really following Lieut. Gen. Levin H. Campbell's advice for eating an elephant: He recommended that the best way to eat an elephant is first to cut it up into small pieces. Accordingly, the Michigan Post's objectives and organization for 1948 have been set up as follows:

I. *Advisory Committee:* Oscar Webber, first vice-president; Charles T. Fisher, Jr., second vice-president; Edward T. Gushee, past president; H. Lynn Pierson, past president.

II. *Objectives for 1948:* (1) Maintain and improve membership both in quantity and quality, particularly by bringing into active participation the young men who would likely be the heads of Michigan industry in any emergency ten to fifteen years hence; (2) Provide adequate constructive and interesting activities to justify a large and active membership through (a) a full-scale military demonstration of logistic and tactical progress by the combined forces in June; (b) an annual banquet and meeting in December; (c) six or more meetings on pertinent industry-military subjects led by qualified members of industry and the armed forces, bringing together interested sections of our membership; (3) The Executive Committee of the American Ordnance Association has requested the Michigan Post to act as host for the Thirtieth Annual Meeting to be held in Detroit on June 9th, the day before our projected demonstration of tactical equipment at Selfridge Field, Mich.

III. *Organization:* Our first step in setting up the organization was to obtain from each director and the heads of a number of other businesses their coöperation in selecting certain of their executive and technical personnel to participate in the affairs of the Post.

The response was most gratifying, and a very representative group of forty-five to fifty individuals expressed their willingness not only to lend their services in organizing and executing Michigan Post activities but also to serve as the Post's representative or contact within their own companies. In a number of cases this had been supplemented by the appointment of others where numerous plants or divisions of a corporation are involved.

This company representative or contact has proved most helpful in the past in quickly disseminating information on meetings or dinners and has gained a much better response than was ever possible through the less forceful practice of merely mailing invitations or announcements to individuals.

Basically, the Michigan Post organization plan consists of:

1. *A Membership Committee* of eighteen members with the following officers: F. R. Valpey, vice-president, Standard Products Company, *chairman;* R. J. Hodson, vice-president, National Bank of Detroit, *vice-chairman;* W. G. Lewellen, vice-president, General Motors Corporation, *vice-chairman, automobile industry section;* K. B. Coates, vice-president, Great Lakes Steel Corporation, *vice-chairman, general industry section.*

2. *An Activities Committee* of fifteen members officered by the following: W. F. Rockwell, president, Timken-Detroit Axle Company, *chairman;* W. O. Briggs, Jr., vice-president, Briggs Manufacturing Company, *vice-chairman;* H. R. Boyer, director of production engineering, General Motors Corporation, *vice-chairman, military demonstration and annual meeting;* C. L. Jacobson, assistant general manager, Chrysler Corporation, *vice-chairman, technical meetings;* and Larry Fischer, vice-president, Timken-Detroit Axle Company, *vice-chairman, arrangements and publicity.*

3. *Out-State Chapters and Activities:* H. J. Sullivan, zoning engineer, Detroit-Edison Company, *chairman.* Vice-chairmen for membership and activities, plus resident members with the chapters will be appointed shortly.

The willing acceptance of responsibility and the generous contributions of time and effort from so many people have been most gratifying and certainly seems to augur well for the successful accomplishment of the objectives of the Michigan Post for 1948.

Mr. Biggers is president of the Michigan Post, American Ordnance Association, and president of the Fargo Division, Chrysler Corporation.

Association Affairs

THE ORDNANCE FRATERNITY IN UPSTATE NEW YORK

A series of meetings of chapters of the A.O.A. in upstate New York was held in rapid succession early in February when Lyman K. Stuart, chief of the Rochester Ordnance District, visited with officers and members of the respective groups. He was accompanied by Leo A. Codd, executive vice-president of the Association.

A luncheon meeting of the officers and directors of the Capital Cities Chapter was held on February 9th at Schenectady, N. Y. Honored guests at the meeting, in addition to Mr. Stuart, were Col. Ledyard Cogswell, who for many years was chief of the Rochester Ordnance District, and Col. Harry N. Rising, commanding officer, Watervliet Arsenal, Watervliet, N. Y. Following the luncheon there was a round-table discussion of plans and activities of the chapter for the coming months.

The officers of the chapter are: Warren E. Hoffman, General Electric Company, Schenectady, president, board of directors; Alec Elliott, General Electric Company, Schenectady, chairman, program and publicity; Albert M. DeMont, General Electric Company, Schenectady, chairman, membership; Edward S. Webster, Watervliet Arsenal, secretary-treasurer.

On the evening of February 9th there was a meeting of several hundred members of the Mohawk Valley Chapter with James M. Kennedy, Rome Manufacturing Division, Revere Copper & Brass Company, as chairman.

A program of future activities was presented and the following officers were elected for the ensuing year: Mr. Kennedy, chairman; Gordon T. Wood, Savage Arms Corporation, Utica, N. Y., chairman, membership; Lyle B. Reigler, Moser & Cotins, Inc., Utica, secretary.

The following day at Syracuse, N. Y., there was a meeting of members of the chapter at which many ordnance stalwarts were present. The meeting was arranged by Carl F. Dietz who has taken a leading part in ordnance affairs throughout the years, capably assisted by E. Gwyn Thomas, former public relations officer of the Rochester Ordnance District.

The officers of the Syracuse Chapter are: Carl C. Frostholm, Beaver Machine & Tool Company, Syracuse, chairman; Philip Glassey, Easy Washing Machine Company, Syracuse; Mark Russell, Pass & Seymour, Inc., Syracuse, chairman, membership; Mr. Thomas, Manufacturers' Association, Syracuse, secretary.

Mr. Stuart was also the honor guest at a meeting of the Rochester Chapter, the officers of which assembled at the Rochester Club for luncheon on February 11th. Frank J. Smith, a director of the American Ordnance Association, presided at the luncheon at which was present a group of industrial leaders of the Rochester area.

The officers of the chapter are: Raymond M. Biehler, Distillation Products, Rochester, N. Y., chairman; Orrin J. Mitchell, Union Steel Chest Corporation, LeRoy, N. Y., vice-chairman; Earl T. Gruendike, General Railway Signal Company, Rochester, chairman, meeting committee; Raymond F. Healy, Erskine-Healy, Inc., Rochester, chairman, membership.

The Frontier Chapter of the Rochester Post held a meeting at Buffalo that same evening, February 11th, when Col. H. B. Sheets, vice-president, Marine Trust Company, Buffalo, presided. Here again there was an outstanding group of Industry-Ordnance leaders assembled to greet the chief of the Rochester District and the vice-president of the national Association. The principal speaker was Dr. C. F. Green of the General Electric Research Laboratories, Schenectady, who presented a most interesting illustrated talk on V-2 rockets.

The officers of the Frontier Chapter are: Colonel Sheets, chairman; Roy C. Neal, R. C. Neal Company, Buffalo, chairman, membership; Keith Williams, Pratt & Letchworth Company, Buffalo, chairman, steering committee.

ORDNANCE AFFAIRS IN MILWAUKEE

Col. Fred D. Hansen, president of the Milwaukee Post, A.O.A., capably assisted by Jacobus Kruyne, secretary of the Post, arranged a meeting of the directors on the evening of February 24th at the Milwaukee Club where Don Compton, chief of the Chicago Ordnance District, and Leo A. Codd, executive vice-president of the American Ordnance Association, were the principal guests. Reports of officers were presented and discussed. A feature of the meeting was a round-table analysis of the European situation and of industrial-preparedness progress in the United States.

The officers and directors of the Milwaukee Post are: Colonel Hansen, president; N. R. Knox, vice-president; Directors F. R. Bacon, P. H. Batten, L. R. Clausen, W. W. Coleman, J. E. DeLong, H. S. Falk, G. H. Fobian, Walter Geist, Colonel Hansen, H. S. Johnson, Jr., Mr. Knox, H. V. Kohler, J. C. Merwin, R. A. Uihlein, P. J. E. Wood; Secretary-Treasurer Jacobus Kruyne, Marshall & Ilsley Bank, Milwaukee.

A TRIBUTE TO COLONEL SLEZAK

The annual dinner of the Chicago Post, A.O.A., was held at the Palmer House in Chicago on the evening of February 25th. The toastmaster was Col. John Slezak, president of the Post, and the principal speaker was Leo A. Codd, executive vice-president of the A.O.A. and editor of ORDNANCE, who described some of his experiences on a recent trip to the British and American Zones in Germany.

Also at the speakers' table were: M. J. Allen, assistant vice-president, American Steel Foundries, Post secretary; E. J. Bush, president, Diamond T Motor Car Company; George R. Catlett, Arthur Andersen & Company, assistant treasurer of the Post; Don Compton, chief, Chicago Ordnance District; G. D. Dearlove, general auditor, International Harvester Company, Post treasurer; Rear Adm. J. Cary Jones, U.S.N.; J. W. Karraker, second vice-president, Northern Trust Company; E. J. O'Keefe, O'Keefe & Walters, consultants, assistant secretary of the Post; F. W. Parker, Jr., Parker & Carter, attorneys; Comdr. F. N. Phillips, U.S.N.; H. J. Prebensen, vice-president, Air Comfort Corporation, Post vice-president; W. G. Swartchild, Jr., president, Swartchild & Company; William Ryer Wright, vice-president, Ford, Bacon, & Davis, Inc.

ORDNANCE IN THE NORTHWEST

Don Compton, chief of the Chicago Ordnance District, attended a luncheon meeting of the officers and directors of the Northwest Post of the Association at Minneapolis on the evening of March 16th and a similar meeting of the officers of the Quad Cities-Iowa Post at Rock Island Arsenal that same evening.

In both cases, Mr. Compton, who was accompanied by the executive vice-president of the national Association, reviewed the current status of industrial-preparedness activities of the

Chicago District. Plans for strengthening the coöperation between the local Posts of the Association and the district were the subject of considerable discussion at both meetings.

The officers and directors of the Northwest Post are: President H. A. Bullis; Vice-Presidents W. C. MacFarlane, H. W. Sweatt; Directors A. P. Baston, Fred Blumers, P. G. Bourne, C. E. Buckbee, R. P. Carlton, C. L. Horn, W. F. Kasper, L. S. Oakes, D. W. Onan, G. H. Rozum, W. G. Seeger, D. A. Smith, A. V. Stallard, H. A. Washburn, A. M. Wilson, F. B. Winston, Brison Wood; Secretary-Treasurer R. F. Wilson, Palace Building, Minneapolis 1, Minn.

The officers and directors of the Quad Cities-Iowa Post are: President T. E. Stahl; Vice-President E. W. Ross; Directors Frank Anderson, R. E. Choate, J. H. Diedrich, L. M. Gildea, Henry Lord, K. E. Madden, Fred Maytag, II, C. R. Sheaffer, George Uhlmeyer, C. A. Waldmann, G. L. Weissenburger, C. D. Wiman; Secretary-Treasurer Donald Meyers, Rock Island Arsenal, Rock Island, Ill.

THE ORDNANCE FRATERNITY IN PITTSBURGH

The largest Industry-Ordnance meeting ever held in the city of Pittsburgh—where a number of historic gatherings have been held—was the annual meeting of the Pittsburgh Post at the William Penn Hotel, March 25, 1948. The objective of the meeting was "to foster preparedness for security and peace."

The principal speaker was Arthur M. Hill, Chairman, National Security Resources Board, who spoke on the topic "What Are the Requirements for National Security?" His address is published as a leading article in this issue of ORDNANCE (p. 386).

The toastmaster at the meeting was James L. Walsh, president, American Ordnance Association, who was introduced by Hugh C. Minton, president of the Pittsburgh Post.

Also seated at the speakers' table were: Capt. Morgan C. Barrett, U.S.N.; Capt. W. P. Chilton, U.S.N.; Leo A. Codd, executive vice-president, American Ordnance Association; Col. F. H. Falkner, U.S.A.; Col. F. J. Gillespie, U.S.A.; Maj. Gen. E. S. Hughes, Chief of Ordnance, U.S.A.; C. Jared Ingersoll, Executive Committee, A.O.A.; Harvey C. Knowles, vice-president, A.O.A; Brig. Gen. Burton O. Lewis, U.S.A., Retired; Maj. Gen. C. F. Robinson, U.S.A.; H. H. Rogge, president, Navy Industrial Association; Maj. Samuel B. Rotharmel, U.S.A.

ORDNANCE IN THE NATION'S CAPITAL

On February 26th, members of the Washington Post gathered in the officers' mess of the Naval Gun Factory as guests of Adm. T. D. Ruddock, commandant. Following the luncheon, a seminar on naval ordnance work was given by the Gun Factory staff. A two-hour tour of the production plant concluded the meeting.

Brig. Gen. E. B. McKinley, commandant of the Industrial College of the Armed Forces, conducted a seminar on industrial preparedness. The rainy night of March 16th restricted attendance, but those present enjoyed the deepest approach to this vital problem, magnificently presented by the staff of instructors —picked men of the Nation's armed forces.

Members of the Washington and Aberdeen Posts gathered for a luncheon on March 30th to hear Maj. Gen. S. P. Spalding's address on the part played by the Munitions Board in industrial preparedness. The president of the Post presided, and the speaker was introduced by James L. Walsh, national President of the A.O.A. and a West Point classmate of General Spalding.

A pleasing note of coöperation between national defense associations is sounded by two gracious invitations to members of the Washington Post. Col. F. H. Kohloss, executive secretary of the Society of American Military Engineers, has invited all A.O.A. members to attend the twenty-eighth annual meeting of that society at Fort Belvoir, Va., on May 7, 1948. Members of the Post likewise have been asked by Col. Ludlow King, president of the Chemical Corps Association, to attend its third annual meeting at Edgewood Arsenal on May 21, 1948. Cards of invitation have been sent to all members of the Washington Post.—F. W. FOSTER GLEASON, *president.*

AND ON THE BANKS OF THE CHESAPEAKE

The following officers and directors of the Aberdeen Proving Ground Post, A.O.A., were recently elected: C. F. McKnight, president; F. D. Dolan, vice-president; Maj. C. W. Clark, treasurer; L. W. Nederkorn, secretary; T. F. Colleran, Dr. L. A. Delsasso, G. B. Jarrett, L. C. Josephs, Dr. T. E. Sterne, and R. P. Witt, directors.

On the ballot for the election of officers and directors appeared this question: "Do you favor the publication and distribution by the American Ordnance Association of the A.O.A. Business Letter written by E. B. Gallaher?" The certified count of ballots showed the following results: Yes—200; No—62; No opinion—26; Not voting—3.

NECROLOGY

Col. Robert Patterson Lamont, a founder of the American Ordnance Association and a member of its Board of Directors from the society's inception in 1919, died in New York City, February 19, 1948. He directed the Procurement Division of the Ordnance Department of the Army in World War I and maintained his unfailing interest in Ordnance affairs with sterling regularity throughout the past thirty years.

Born in Detroit, December 1, 1867, he was graduated with a degree in civil engineering from the University of Michigan in 1891. In 1897 he became president of the Simplex Railway Appliance Company which later was affiliated with American Steel Foundries of which he was elected president in 1912.

During the first World War Colonel Lamont served as a major in the Army and later as chief of the Procurement Division of the Army Ordnance Department in Washington. He retired with the rank of colonel in 1919 and received the Distinguished Service Medal.

While serving as Secretary of Commerce in the cabinet of President Hoover he was awarded a gold medal by the Army Ordnance Association in recognition of his outstanding service to industrial preparedness.

After leaving his Cabinet post in 1932 at the end of Mr. Hoover's term, Colonel Lamont was president of the American Iron and Steel Institute for a year.

In his death the Ordnance cause loses one of its staunchest leaders and industry one of its preëminent administrators.

NOTICE also has been received of the deaths of the following members of the Association: A. D. Adams, Ambridge, Pa.; A. M. Brickley, Mt. Sterling, Ky.; John Bronstein, Allentown, Pa.; B. F. Courtright, Chicago, Ill.; J. C. Davidson, Chester, Pa.; L. J. Dennis, St. Louis, Mo.; T. C. Dougherty, Cleveland, Ohio; E. W. Elliott, Miami, Okla.; F. K. Ferry, Dover, N. J.; L. E. Galbraith, Toledo, Ohio; H. W. Gilbert, Cleveland, Ohio; M. A. Hirsch, Opelousas, La.; Henry Janssen, Reading, Pa.; J. C. Joyce, Puente, Calif.; A. C. Klein, Boston, Mass.; E. M. Kropp, Cleveland, Ohio; I. C. Kuebler, Savanna, Ill.; E. S. Lee, Dayton, Ohio; N. J. Morrissey, Cohoes, N. Y.; P. J. Monahan, Estes Park, Colo.; Leonard Munson, Austin, Minn.; J. W. Parker, West Barrington, R. I.; Guy Patterson, Rotan, Tex.; Howard Poff, Lake Odessa, Mich.; Lewis Potter, Alhambra, Calif.; H. D. Scott, Wheeling, W. Va.; L. C. Selmi, Detroit, Mich.; M. M. Singleton, Dover, N. J.; D. H. Snedigar, Aberdeen Proving Ground, Md.; W. J. Tillner, Warsaw, N. Y.; L. G. Torborg, Jr., St. Albans, N. Y.; J. H. Veteran, Walnut Grove, Calif.; H. D. Wilson, Hickman, Ky.; A. E. Wishon, San Francisco, Calif. To their relatives and friends, ORDNANCE, on behalf of the Association membership, extends condolences.

Honor Roll of Industrial Preparedness

Here are inscribed the names of the Company Members of the American Ordnance Association, some of the principal industrial organizations of the United States which are leaders in effecting scientific and industrial preparedness for our security and peace.

ACF-BRILL MOTORS COMPANY . . . PHILADELPHIA
ACME STEEL COMPANY . . . . . CHICAGO
ADVANCE STAMPING COMPANY . . . . . DETROIT
AEROJET ENGINEERING CORPORATION . . . AZUSA
AETNA-STANDARD ENGINEERING CO. . YOUNGSTOWN
AIR REDUCTION SALES COMPANY . . . NEW YORK
AJAX ELECTROTHERMIC CORPORATION . . TRENTON
ALLEGHENY LUDLUM STEEL CORP. . . BRACKENRIDGE
ALLIS-CHALMERS MANUFACTURING COMPANY . . . . . MILWAUKEE
ALTON BOX BOARD COMPANY . . . . . ALTON
ALTORFER BROTHERS COMPANY . . . . . PEORIA
ALUMINUM COMPANY OF AMERICA . . . PITTSBURGH
AMERICAN BANTAM CAR COMPANY . . . . BUTLER
AMERICAN BOSCH CORPORATION . . SPRINGFIELD
AMERICAN BRASS COMPANY . . . . WATERBURY
AMERICAN CAR AND FOUNDRY COMPANY . NEW YORK
AMERICAN FORK & HOE COMPANY . . . CLEVELAND
AMERICAN HYDRAULICS, INC. . . . . SHEBOYGAN
AMERICAN INSTRUMENT COMPANY . . SILVER SPRING
AMERICAN LOCOMOTIVE COMPANY . . . NEW YORK
AMERICAN MACHINE & FOUNDRY CO. . . NEW YORK
AMERICAN METAL PRODUCTS COMPANY . . DETROIT
AMERICAN PULLEY COMPANY . . . PHILADELPHIA
AMERICAN RADIATOR & STANDARD SANITARY CORPORATION . . . . . PITTSBURGH
AMERICAN SEATING COMPANY . . . GRAND RAPIDS
AMERICAN STEEL & WIRE COMPANY . . CLEVELAND
AMERICAN STEEL FOUNDRIES . . . . . CHICAGO
AMP CORPORATION . . . . . ST. LOUIS
ANCHOR PACKING COMPANY . . . PHILADELPHIA
ANHEUSER-BUSCH, INC. . . . . ST. LOUIS
ANIMAL TRAP COMPANY OF AMERICA . . . LITITZ
ARMSTRONG CORK COMPANY . . . . LANCASTER
ASSOCIATED SPRING CORPORATION . . . BRISTOL
ATLANTIC SHEET METAL CORPORATION . . ATLANTA
ATLAS POWDER COMPANY . . . . WILMINGTON
AUSTIN POWDER COMPANY . . . . . CLEVELAND
AUTOCAR COMPANY . . . . . ARDMORE
AUTO SPECIALTIES MANUFACTURING CO. . ST. JOSEPH

B. G. MACHINE COMPANY . . . . . NEW HAVEN
BAGLEY & SEWALL COMPANY . . . . WATERTOWN
BAKER & COMPANY . . . . . NEWARK
BAKER OIL TOOLS, INC. . . . . LOS ANGELES
BALDWIN COMPANY . . . . . CINCINNATI
BARNES COMPANY, W. F. & JOHN . . . ROCKFORD
BASTIAN-BLESSING COMPANY . . . . . CHICAGO
BAUER BROTHERS COMPANY . . . . SPRINGFIELD
BELL & GOSSETT COMPANY . . . . MORTON GROVE
BELL & HOWELL COMPANY . . . . . CHICAGO
BELL TELEPHONE COMPANY OF PENNSYLVANIA . . . . . PHILADELPHIA
BELLE CITY MALLEABLE IRON COMPANY . . RACINE
BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY . . . . . ELYRIA
BETHLEHEM STEEL CORPORATION . . . BETHLEHEM
BIRDSBORO STEEL FOUNDRY & MACHINE COMPANY . . . . . BIRDSBORO
BIRTMAN ELECTRIC COMPANY . . . . . CHICAGO
BLACK & DECKER MANUFACTURING COMPANY TOWSON
BLANCHARD MACHINE COMPANY . . . CAMBRIDGE
BLAW-KNOX COMPANY . . . . . BLAWNOX
BOUND BROOK OIL-LESS BEARING COMPANY . . . . . BOUND BROOK
BOWSER, INC. . . . . FORT WAYNE
BREEZE CORPORATIONS, INC. . . . . NEWARK
BRIDGEPORT BRASS COMPANY . . . . BRIDGEPORT
BRIGGS & STRATTON CORPORATION . . MILWAUKEE
BUCKEYE STEEL CASTINGS COMPANY . . COLUMBUS
BUCYRUS-ERIE COMPANY . . . SOUTH MILWAUKEE
BUHL MANUFACTURING COMPANY . . . . DETROIT
BULOVA WATCH COMPANY . . . . . NEW YORK
BURKE COMPANY, O. W. . . . . DETROIT
BURKEY UNDERWEAR COMPANY . . . HAMBURG
BUTTERWORTH & SONS CO., H. W. . . PHILADELPHIA

CAREY-MCFALL COMPANY . . . . PHILADELPHIA
CARGOCAIRE ENGINEERING CORPORATION . NEW YORK
CARNEGIE-ILLINOIS STEEL CORPORATION PITTSBURGH
CARTER CARBURETOR CORPORATION . . ST. LOUIS
CASE COMPANY, J. I. . . . . RACINE
CATERPILLAR TRACTOR COMPANY . . . . PEORIA
CELANESE CORPORATION OF AMERICA . . NEW YORK
CENTRAL CAN COMPANY . . . . . CHICAGO
CENTRAL FOUNDRY COMPANY . . . . NEW YORK
CHAIN BELT COMPANY . . . . . MILWAUKEE
CHAMBERLIN COMPANY OF AMERICA . . . DETROIT
CHASE BRASS & COPPER COMPANY . . . WATERBURY
CHICAGO EXTRUDED METALS COMPANY . . CICERO
CHRISTEN & SONS COMPANY, FRED . . . TOLEDO
CHRYSLER CORPORATION . . . . . DETROIT
CINCINNATI MILLING MACHINE COMPANY CINCINNATI
CITIES SERVICE DEFENSE CORPORATION . SHREVEPORT
CLARK GRAVE VAULT COMPANY . . . COLUMBUS
CLARY MULTIPLIER CORPORATION . . LOS ANGELES
CLEARING MACHINE CORPORATION . . . . CHICAGO
CLEVELAND CONTAINER COMPANY . . . CLEVELAND
CLEVELAND GRAPHITE BRONZE COMPANY . CLEVELAND
COBUSCO STEEL PRODUCTS . . . . . DENVER
COCA-COLA COMPANY . . . . . ATLANTA
COLORADO FUEL & IRON CORPORATION . . DENVER
COLT'S MANUFACTURING COMPANY . . HARTFORD
COLUMBUS BOLT & FORGING COMPANY . COLUMBUS
COMBUSTION ENGINEERING COMPANY . . NEW YORK
CONTAINER CORPORATION OF AMERICA . . CHICAGO
CONTINENTAL MOTORS CORPORATION . . . DETROIT

(Continued on next page)

Honor Roll of Industrial Preparedness

COPPERWELD STEEL COMPANY . . . . . WARREN
CORBITT COMPANY . . . . . HENDERSON
CRANE COMPANY . . . . . CHICAGO
CROWN CORK & SEAL COMPANY . . . BALTIMORE
CUSHMAN MOTOR WORKS . . . . . LINCOLN
CUTLER-HAMMER, INC. . . . . MILWAUKEE

DALTON FOUNDRIES, INC. . . . . WARSAW
DARLING VALVE & MANUFACTURING COMPANY . . . . . WILLIAMSPORT
DAVIS COMPANY, H. B. . . . . BALTIMORE
DAVISON CHEMICAL CORPORATION . . . BALTIMORE
DAYTON RUBBER MANUFACTURING COMPANY . DAYTON
DEERE & COMPANY . . . . . MOLINE
DEFIANCE AUTOMATIC SCREW COMPANY . DEFIANCE
DELCO-REMY DIVISION, GMC . . . . ANDERSON
DELTA MANUFACTURING COMPANY . . MILWAUKEE
DETROIT AUTOMOTIVE PRODUCTS CORP. . . DETROIT
DEXTER COMPANY . . . . . FAIRFIELD
DISSTON & SONS, INC., HENRY . . . PHILADELPHIA
DOEHLER-JARVIS CORPORATION . . . NEW YORK
DRAVO CORPORATION . . . . . PITTSBURGH
DUNCAN ELECTRIC MANUFACTURING COMPANY . . . . . LAFAYETTE
DU PONT DE NEMOURS & COMPANY, E. I. WILMINGTON
DURASTEEL COMPANY . . . . . HANNIBAL
DURIRON COMPANY . . . . . DAYTON
DUTTON COMPANY, C. H. . . . . KALAMAZOO

EASTERN STAINLESS STEEL CORPORATION . BALTIMORE
EASTERN TOOL & MANUFACTURING COMPANY . . . . . BLOOMFIELD
EASTMAN KODAK COMPANY . . . . ROCHESTER
EASY WASHING MACHINE CORPORATION . SYRACUSE
EATON MANUFACTURING COMPANY . . CLEVELAND
EDGEWATER STEEL COMPANY . . . . PITTSBURGH
EDISON, INC., THOMAS A. . . . . WEST ORANGE
ELASTIC STOP NUT CORPORATION . . . . UNION
ELECTRIC AUTO-LITE COMPANY . . . . TOLEDO
ELECTRIC FURNACE COMPANY . . . . . SALEM
ELECTRIC STORAGE BATTERY COMPANY PHILADELPHIA
ELGIN NATIONAL WATCH COMPANY . . . ELGIN
EMERSON ELECTRIC MANUFACTURING COMPANY . . . . . ST. LOUIS
EVANS' SONS, INC., JOHN . . . . PHILADELPHIA
EXACT WEIGHT SCALE COMPANY . . . COLUMBUS
EX-CELL-O CORPORATION . . . . . DETROIT

FAIRBANKS, MORSE & COMPANY . . . . BELOIT
FALK CORPORATION . . . . . MILWAUKEE
FARBER, INC., S. W. . . . . BROOKLYN
FARQUHAR COMPANY, A. B. . . . . YORK
FEDERAL LABORATORIES, INC. . . . . PITTSBURGH
FEDERAL MOTOR TRUCK COMPANY . . . . DETROIT
FELT AND TARRANT MANUFACTURING COMPANY . . . . . CHICAGO
FERRO MACHINE & FOUNDRY COMPANY . CLEVELAND
FLANNERY BOLT COMPANY . . . . . BRIDGEVILLE
FOLLANSBEE STEEL CORPORATION . . . PITTSBURGH
FOSTER MACHINE COMPANY . . . . WESTFIELD
FOUR WHEEL DRIVE AUTO COMPANY . CLINTONVILLE
FRAM CORPORATION . . . . . PROVIDENCE
FRANTZ COMPANY, S. G. . . . . NEW YORK
FRENCH & SONS PIANO DIVISION, H. & A. SELMER, INC. . . . . NEW CASTLE
FRICK-GALLAGHER MANUFACTURING COMPANY . . . . . WELLSTON
FULLER BRUSH COMPANY . . . . . HARTFORD
FURNAS ELECTRIC COMPANY . . . . . BATAVIA

GAIR COMPANY, ROBERT . . . . . NEW YORK
GATES RUBBER COMPANY . . . . . DENVER
GEAR GRINDING MANUFACTURING COMPANY . DETROIT
GENERAL DYESTUFF CORPORATION . . NEW YORK
GENERAL ELECTRIC COMPANY . . . SCHENECTADY
GENERAL FIREPROOFING COMPANY . YOUNGSTOWN
GENERAL STEEL CASTINGS CORPORATION EDDYSTONE
GENERAL STEEL PRODUCTS CORPORATION FLUSHING
GENERAL TEXTILE MILLS, INC. . . . . NEW YORK
GENERAL TIME INSTRUMENTS CORP. . . NEW YORK
GENERAL TIRE & RUBBER COMPANY . . . AKRON
GERITY-MICHIGAN CORPORATION . . . . ADRIAN
GERRITSON COMPANY, J. . . . . KANKAKEE
GERSTENSLAGER COMPANY . . . . . WOOSTER
GIDDINGS & LEWIS MACHINE TOOL COMPANY . . . . . FOND DU LAC
GILBERT & BARKER MANUFACTURING COMPANY . . . . . SPRINGFIELD
GILLETTE SAFETY RAZOR COMPANY . . . BOSTON
GISHOLT MACHINE COMPANY . . . . MADISON
GLADD BROTHERS, INC. . . . . SARANAC LAKE
GLEASON WORKS . . . . . ROCHESTER
GLIDDEN COMPANY . . . . . CLEVELAND
GLOBE COMPANY . . . . . CHICAGO
GLOBE-UNION, INC. . . . . MILWAUKEE
GOODRICH COMPANY, B. F. . . . . AKRON
GORTON MACHINE COMPANY, GEORGE . . . RACINE
GRANITE CITY STEEL COMPANY . . GRANITE CITY
GREAT LAKES STEEL CORPORATION . . . ECORSE
GREDE FOUNDRIES, INC. . . . . MILWAUKEE
GREENE MANUFACTURING COMPANY . . . RACINE
GREENFIELD TAP & DIE CORPORATION GREENFIELD
GULF OIL CORPORATION . . . . . PITTSBURGH
GUNDLACH MANUFACTURING CORPORATION FAIRPORT

HANNIFIN CORPORATION . . . . . CHICAGO
HARNISCHFEGER CORPORATION . . . MILWAUKEE
HARRINGTON & RICHARDSON ARMS COMPANY . . . . . WORCESTER
HARRINGTON-WILSON-BROWN COMPANY . NEW YORK
HARRISBURG STEEL CORPORATION . . . HARRISBURG
HARRIS-SEYBOLD COMPANY . . . . CLEVELAND
HARSHAW CHEMICAL COMPANY . . . CLEVELAND
HARVEY MACHINE COMPANY . . . LOS ANGELES
HEIL COMPANY . . . . . MILWAUKEE
HEINEMANN ELECTRIC COMPANY . . . TRENTON
HEINTZ MANUFACTURING COMPANY . PHILADELPHIA
HENDEY MACHINE COMPANY . . . . TORRINGTON
HENDRICK MANUFACTURING COMPANY CARBONDALE
HENRY & WRIGHT MANUFACTURING COMPANY . . . . . HARTFORD
HEPPENSTALL COMPANY . . . . . PITTSBURGH
HERCULES MOTORS CORPORATION . . . CANTON
HERCULES POWDER COMPANY . . . . WILMINGTON

Honor Roll of Industrial Preparedness

HEYDEN CHEMICAL CORPORATION . . . NEW YORK
HIGH SPEED HAMMER COMPANY . . . ROCHESTER
HOBART MANUFACTURING COMPANY . . . TROY
HOE & COMPANY, R. . . . . NEW YORK
HOLLINGSHEAD CORPORATION, R. M. . . . CAMDEN
HOOVER COMPANY . . . . . NORTH CANTON
HOUGHTON & COMPANY, E. F. . . . PHILADELPHIA
HUGHES TOOL COMPANY . . . . . HOUSTON
HUPP CORPORATION . . . . . CLEVELAND
HYATT BEARINGS DIVISION, GMC . . . HARRISON

INLAND STEEL COMPANY . . . . . CHICAGO
INTERCHEMICAL CORPORATION . . . NEW YORK
INTER-COASTAL PAINT CORPORATION . . BALTIMORE
INTERNATIONAL BUSINESS MACHINES CORPORATION . . . . . NEW YORK
INTERNATIONAL CHAIN & MANUFACTURING COMPANY . . . . . YORK
INTERNATIONAL HARVESTER COMPANY . . CHICAGO
INTERNATIONAL NICKEL COMPANY . . NEW YORK

JACOBS COMPANY, F. L. . . . . DETROIT
JOA, INC., CURT G. . . . . SHEBOYGAN
JOHNS-MANVILLE SALES CORPORATION . NEW YORK
JOHNSON AUTOMATICS, INC. . . . . BOSTON
JONES & LAMSON MACHINE COMPANY . SPRINGFIELD
JONES & LAUGHLIN STEEL CORPORATION . PITTSBURGH

KEARNEY & TRECKER CORPORATION . . WEST ALLIS
KELLY-SPRINGFIELD TIRE COMPANY . CUMBERLAND
KELSEY-HAYES WHEEL COMPANY . . . DETROIT
KENWORTH MOTOR TRUCK CORPORATION . . SEATTLE
KEUFFEL & ESSER COMPANY . . . . HOBOKEN
KING-SEELEY CORPORATION . . . . ANN ARBOR
KINGSBURY MACHINE TOOL CORPORATION . KEENE
KNAPP-MONARCH COMPANY . . . . ST. LOUIS
KOEHRING COMPANY . . . . . MILWAUKEE
KOHLER COMPANY . . . . . KOHLER
KOPPERS COMPANY . . . . . PITTSBURGH

LAKE CITY MALLEABLE IRON COMPANY . CLEVELAND
LANDIS TOOL COMPANY . . . . . WAYNESBORO
LANSDOWNE STEEL & IRON COMPANY . . . MORTON
LAPOINTE MACHINE TOOL COMPANY . . . HUDSON
LEBANON STEEL FOUNDRY . . . . . LEBANON
LEE TIRE & RUBBER COMPANY . . . CONSHOHOCKEN
LEEDS & NORTHRUP COMPANY . . . PHILADELPHIA
LEHIGH FOUNDRIES, INC. . . . . EASTON
LIEBERKNECHT, INC., KARL . . . . . READING
LINCOLN ELECTRIC COMPANY . . . . CLEVELAND
LINCOLN ENGINEERING COMPANY . . . ST. LOUIS
LINK-BELT COMPANY . . . . . CHICAGO
LUKENS STEEL COMPANY . . . . COATESVILLE
LYNCHBURG FOUNDRY COMPANY . . . LYNCHBURG

MARLIN-ROCKWELL CORPORATION . . . JAMESTOWN
MASLAND & SONS, C. H. . . . . CARLISLE
MASON & HANGER COMPANY . . . . NEW YORK
MATHEWS CONVEYOR COMPANY . . ELLWOOD CITY
MAXSON CORPORATION, W. L. . . . . NEW YORK
MCKAY COMPANY . . . . . PITTSBURGH
MERCK & COMPANY . . . . . RAHWAY
MICA INSULATOR COMPANY . . . . NEW YORK
MIDVALE COMPANY . . . . . PHILADELPHIA
MIDWEST PIPING AND SUPPLY COMPANY . ST. LOUIS
MILCO UNDERGARMENT COMPANY . . BLOOMSBURG
MILSCO MANUFACTURING COMPANY . . MILWAUKEE
MINES EQUIPMENT COMPANY . . . . ST. LOUIS
MINNEAPOLIS-HONEYWELL REGULATOR COMPANY . . . . . MINNEAPOLIS
MINNEAPOLIS-MOLINE POWER IMPLEMENT COMPANY . . . . . MINNEAPOLIS
MISSISSIPPI RIVER FUEL CORPORATION . ST. LOUIS
MONROE AUTO EQUIPMENT COMPANY . . . MONROE
MONROE CALCULATING MACHINE COMPANY . ORANGE
MOORE ENAMELING & MANUFACTURING COMPANY . . . . . WEST LAFAYETTE
MOSLER SAFE COMPANY . . . . . HAMILTON
MULLINS MANUFACTURING CORPORATION . . SALEM
MUNSINGWEAR, INC. . . . . MINNEAPOLIS

NARROW FABRIC COMPANY . . . . . READING
NASH ENGINEERING COMPANY . . SOUTH NORWALK
NATIONAL ACME COMPANY . . . . . CLEVELAND
NATIONAL ASSOCIATION OF INSURANCE AGENTS . . . . . NEW YORK
NATIONAL AUTOMOTIVE FIBRES, INC. . . . DETROIT
NATIONAL ENAMELING & STAMPING COMPANY . . . . . MILWAUKEE
NATIONAL LOCK WASHER COMPANY . . . NEWARK
NATIONAL MALLEABLE & STEEL CASTINGS COMPANY . . . . . CLEVELAND
NATIONAL SCREW & MANUFACTURING COMPANY . . . . . CLEVELAND
NATIONAL SLUG REJECTORS, INC. . . . ST. LOUIS
NATIONAL SUPPLY COMPANY . . . . PITTSBURGH
NEW BRITAIN MACHINE COMPANY . . NEW BRITAIN
NEW ENGLAND BOX COMPANY . . . . GREENFIELD
NEW YORK AIR BRAKE COMPANY . . . NEW YORK
NORDBERG MANUFACTURING COMPANY . MILWAUKEE
NORRIS STAMPING & MANUFACTURING COMPANY . . . . . LOS ANGELES
NORTON COMPANY . . . . . WORCESTER

OAKITE PRODUCTS, INC. . . . . NEW YORK
OCEAN CITY MANUFACTURING COMPANY PHILADELPHIA
OHIO FALLS DYE & FINISHING WORKS . . LOUISVILLE
OILGEAR COMPANY . . . . . MILWAUKEE
OLIN INDUSTRIES, INC. . . . . EAST ALTON
OLIVER CORPORATION . . . . . CLEVELAND
OMAHA STEEL WORKS . . . . . OMAHA
OTIS ELEVATOR COMPANY . . . . . NEW YORK

PARISH PRESSED STEEL COMPANY . . . . READING
PARKER RUST-PROOF COMPANY . . . . DETROIT
PEMCO CORPORATION . . . . . BALTIMORE
PERFEX CORPORATION . . . . . MILWAUKEE
PFIZER & COMPANY, CHARLES . . . . NEW YORK
PHEOLL MANUFACTURING COMPANY . . . CHICAGO
PLUMB, INC., FAYETTE R. . . . . PHILADELPHIA
PLUME & ATWOOD MANUFACTURING COMPANY . . . . . WATERBURY

(Continued on next page)

Honor Roll of Industrial Preparedness

PRESSED STEEL CAR COMPANY . . . . . CHICAGO
PROCTER & GAMBLE COMPANY . . . . CINCINNATI

RATHBORNE HAIR & RIDGWAY COMPANY . . CHICAGO
RCA VICTOR DIVISION, RADIO CORP. OF AMERICA . . . . . CAMDEN
REMINGTON RAND, INC. . . . . STAMFORD
REPUBLIC STEEL CORPORATION . . . CLEVELAND
REVERE COPPER & BRASS, INC. . . . NEW YORK
REYNOLDS METALS COMPANY . . . . RICHMOND
REYNOLDS SPRING COMPANY . . . . JACKSON
RHEEM MANUFACTURING COMPANY . . NEW YORK
ROBERTSHAW THERMOSTAT COMPANY . YOUNGWOOD
ROSS GEAR AND TOOL COMPANY . . . LAFAYETTE
RUDEL MACHINERY COMPANY . . . . NEW YORK
RUSSELL MANUFACTURING COMPANY . . MIDDLETON
RUSTLESS IRON & STEEL DIVISION, AMERICAN ROLLING MILL COMPANY . . . . . BALTIMORE

SAGINAW MALLEABLE IRON DIVISION, GMC SAGINAW
ST. LOUIS CAR COMPANY . . . . . ST. LOUIS
SALEM ENGINEERING COMPANY . . . . SALEM
SAVAGE ARMS CORPORATION . . . . . UTICA
SCHLITZ BREWING COMPANY, JOSEPH . . MILWAUKEE
SCHLUETER MANUFACTURING COMPANY . ST. LOUIS
SCHWITZER-CUMMINS COMPANY . . INDIANAPOLIS
SCOVILL MANUFACTURING COMPANY . . WATERBURY
SCULLIN STEEL COMPANY . . . . . ST. LOUIS
SERVEL, INC. . . . . EVANSVILLE
SERVO CORPORATION OF AMERICA . LINDENHURST
SILAS MASON COMPANY . . . . . SHREVEPORT
SIMMONS COMPANY . . . . . NEW YORK
SIMONDS SAW & STEEL COMPANY . . . FITCHBURG
SINGER MANUFACTURING COMPANY . ELIZABETHPORT
SKF INDUSTRIES, INC. . . . . PHILADELPHIA
SMITH CORPORATION, A. O. . . . . MILWAUKEE
SMITH & CORONA TYPEWRITERS, INC., L. C. SYRACUSE
SMITH & WESSON, INC. . . . . SPRINGFIELD
SOSS MANUFACTURING COMPANY . . . . DETROIT
SOUTH CHESTER TUBE COMPANY . . . . CHESTER
SOUTHERN CALIFORNIA PLANT, GMC . SOUTH GATE
SPERRY GYROSCOPE COMPANY . . . . GREAT NECK
SPICER MANUFACTURING DIVISION, DANA CORPORATION . . . . . TOLEDO
SQUARE D COMPANY . . . . . DETROIT
STANDARD PRESSED STEEL COMPANY . JENKINTOWN
STANDARD PRODUCTS COMPANY . . . . DETROIT
STANDARD STEEL SPRING COMPANY . . CORAOPOLIS
STANDARD TUBE COMPANY . . . . . DETROIT
STEARNS-ROGER MANUFACTURING COMPANY DENVER
STERLING MOTOR TRUCK COMPANY . . MILWAUKEE
STOCKHAM PIPE FITTINGS COMPANY . BIRMINGHAM
STONE & WEBSTER ENGINEERING CORPORATION . . . . . NEW YORK
STRATFORD ENGINEERING CORPORATION . KANSAS CITY
STRELINGER COMPANY, CHAS. A. . . . . DETROIT
STUART OIL COMPANY, D. A. . . . . CHICAGO
SUN OIL COMPANY . . . . . PHILADELPHIA
SURFACE COMBUSTION CORPORATION . . . TOLEDO
SUSQUEHANNA MILLS, INC. . . . . NEW YORK
SWANK, INC. . . . . ATTLEBORO
SYMINGTON-GOULD CORPORATION . . . ROCHESTER

TENNESSEE CORPORATION . . . . . NEW YORK
TEXAS GULF SULPHUR COMPANY . . . NEW YORK
THEW SHOVEL COMPANY . . . . . LORAIN
THOMPSON PRODUCTS, INC. . . . . CLEVELAND
TIMKEN-DETROIT AXLE COMPANY . . . . DETROIT
TIMKEN ROLLER BEARING COMPANY . . . CANTON
TITAN METAL MANUFACTURING COMPANY BELLEFONTE
TITEFLEX, INC. . . . . NEWARK
TOKHEIM OIL TANK AND PUMP COMPANY FORT WAYNE
TROJAN POWDER COMPANY . . . . . ALLENTOWN
TWIN DISC CLUTCH COMPANY . . . . . RACINE

UNEXCELLED CHEMICAL CORPORATION . NEW YORK
UNION CARBIDE AND CARBON CORP. . . NEW YORK
UNION METAL MANUFACTURING COMPANY . CANTON
UNION SWITCH & SIGNAL COMPANY . . SWISSVALE
UNITED AIRCRAFT CORPORATION . . EAST HARTFORD
UNITED-CARR FASTENER CORPORATION . CAMBRIDGE
UNITED CHROMIUM, INC. . . . . NEW YORK
UNITED ENGINEERING & FOUNDRY COMPANY . . . . . PITTSBURGH
UNITED STATES RUBBER COMPANY . . . NEW YORK

VICKERS, INC. . . . . DETROIT
VICTOR MANUFACTURING & GASKET CO. . . CHICAGO
VICTORY PLASTICS COMPANY . . . . . HUDSON

WALTERS MANUFACTURING COMPANY . . OAKMONT
WALWORTH COMPANY . . . . . NEW YORK
WARNER ELECTRIC BRAKE MANUFACTURING COMPANY . . . . . BELOIT
WARNER & SWASEY COMPANY . . . . CLEVELAND
WARREN WEBSTER & COMPANY . . . . . CAMDEN
WATERBURY COMPANIES . . . . . WATERBURY
WATERBURY FARRELL FOUNDRY & MACHINE COMPANY . . . . . WATERBURY
WAUKESHA MOTOR COMPANY . . . . WAUKESHA
WEATHERHEAD COMPANY . . . . . CLEVELAND
WEIRTON STEEL COMPANY . . . . . WEIRTON
WESTERN ELECTRIC COMPANY . . . . NEW YORK
WESTINGHOUSE AIR BRAKE COMPANY . . WILMERDING
WESTINGHOUSE ELECTRIC CORPORATION . PITTSBURGH
WHEELING STEEL CORPORATION . . . WHEELING
WHITE MOTOR COMPANY . . . . . CLEVELAND
WILLYS-OVERLAND MOTORS, INC. . . . . TOLEDO
WINCHESTER REPEATING ARMS COMPANY . NEW HAVEN
WINTER-WEISS COMPANY . . . . . DENVER
WIREMOLD COMPANY . . . . . HARTFORD
WISCONSIN MOTOR CORPORATION . . . MILWAUKEE
WOOD COMPANY, R. D. . . . . PHILADELPHIA
WORDEN-ALLEN COMPANY . . . . . MILWAUKEE
WORTHINGTON PUMP & MACHINERY CORPORATION . . . . . HARRISON
WYCKOFF STEEL COMPANY . . . . . PITTSBURGH
WYSONG & MILES COMPANY . . . . GREENSBORO

YORK CORPORATION . . . . . YORK
YOUNG SPRING & WIRE CORPORATION, L. A. . DETROIT
YOUNGSTOWN SHEET & TUBE COMPANY YOUNGSTOWN

ZENITH OPTICAL COMPANY . . . . . HUNTINGTON

The National Divisions, A.O.A.

ROCKET, BOMB, AND ARTILLERY AMMUNITION DIVISION
Harvey C. Knowles, chairman

The great strides made by American industry in the development of new manufacturing techniques will have tremendous influence on ordnance production in any future emergency. This was the theme of an address by Harvey C. Knowles, vice-president, Procter & Gamble Company, who is also vice-president of the American Ordnance Association and chairman of its Rocket, Bomb, and Artillery Ammunition Division.

He told an intimate story of how Procter & Gamble became a loading-plant contractor in World War II and described many of the production problems that came up during the war period. He made a particular plea for encouragement by the Ordnance Department of the potential Government plant contractors to keep their own organizations in a state of readiness.

Mr. Knowles also described some of the recent activities of the American Ordnance Association committees. He made particular comment on the difficult assignment accepted by K. T. Norris, chairman of the Cartridge Case Committee. Among other activities he announced the meeting of the Fuze Committee under the chairmanship of James E. Burke, Stewart-Warner Corporation, with Army and Navy fuze personnel which was to be held at Picatinny Arsenal on April 30, 1948.

Mr. Knowles made this address on February 18, 1948, at a rather unusual meeting held in the Ordnance Committee Room in the Pentagon, Washington, D. C.

Walter N. Howley, president, Lansdowne Steel & Iron Company, Morton, Pa., has accepted the chairmanship of the Rocket and Shell Committee. He succeeds S. E. Skinner, manager, Oldsmobile Division, GMC, who will be enabled to devote his entire attention to the activities of the Artillery Committee.

Mr. Howley designed and operated one of the outstanding Ordnance plants of World War II. The operations of the great shell plant at Gadsden, Ala., which established many records for quantity and quality of product, were under his able direction. The committee is fortunate in obtaining his services.

ARTILLERY DIVISION
J. E. Trainer, chairman

Plans and policies for the most effective assistance to the Ordnance Department of the Army, including the arsenals particularly concerned with artillery matériel, were the topics of a recent meeting of the executive committee of the Artillery Division at Watervliet Arsenal. As a result, the committee made the following recommendations to the Chief of Ordnance:

"1. As the Ordnance Department develops projects, such as production studies, etc., to be made by outsiders, they would be referred to the committee, and we would suggest several companies, who, in the opinion of the committee, would be well qualified to do the work.

"2. At the request of the Ordnance Department, the committee will review the production studies, etc., as made by industrial organizations, and offer criticism.

"3. The committee will be consulted on the subject of tolerances, as raised by the one making the production study, to the end that tolerances, everything considered, will be practical and correct for the job in hand.

"4. The committee will review inspection standards, as set up in connection with any project handled by outside organizations.

"5. While we have been referring specifically to work done by others outside of Ordnance, at the request of the arsenal we will be glad to review with them, in the same manner, any of the projects they are handling themselves."

In commenting to Mr. Trainer, chairman of the Artillery Division, the Chief of Ordnance stated:

"I am delighted with the practical and coöperative spirit of the five points arrived at by the Artillery Committee at the Watervliet Arsenal meeting, and assure you that the Ordnance Department will be happy to utilize the proffered assistance to the greatest possible extent.

"It seems to me that coöperation along the lines sketched out by your committee is of the most helpful and effective nature that industry could offer at this time.

"Please thank the Artillery Committee for their constructive action and accept my thanks for your part, as chairman, in calling and conducting the Watervliet meeting."

SMALL ARMS AND SMALL ARMS AMMUNITION DIVISION
C. K. Davis, chairman

On January 30, 1948, a new organization chart of the Small Arms and Small Arms Ammunition Division was issued showing an executive board of sixteen members supervising the work of four operating committees as follows:

Rifles and Carbines, with J. C. Garand, Springfield Armory, as consultant.

Machine Guns, Belts, Links, with Dr. Samuel G. Green, Ordnance Department, as consultant.

Small Arms Ammunition, with Frank J. Jervey, Ordnance Department, and G. A. Miller (alternate), Frankford Arsenal, as consultants.

Pistols and Revolvers, with E. W. Hopkins, Springfield Armory, as consultant.

The chairman of the Small Arms and Small Arms Ammunition Division has received from Col. M. K. Barroll, Jr., commanding officer of Springfield Armory, a recommendation outlining the present status of production studies in this field. He writes:

"To take advantage of industrial experience gained during the recent war, the Ordnance Department has placed upon Springfield Armory the responsibility of negotiating for a series of contracts with commercial organizations under which these organizations will furnish studies of the various preparedness steps which might be taken during peacetime, the relative effectiveness of these steps in reducing the time necessary to get into high-scale production of small-arms weapons, and the amount of money necessary to put each of these preparedness steps into effect.

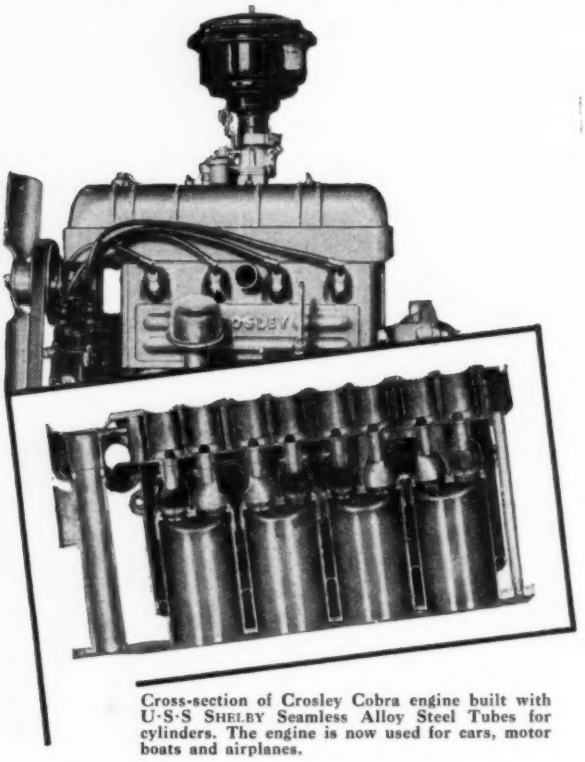
"Studies as outlined above are known as 'Phase I' studies. It is anticipated that this program will be followed up and implemented by specific contracts to put into effect some of the recommendations brought out in these studies. These implementing contracts are known as 'Phase II' contracts. . .

"No contracts have been concluded to date, but negotiations have been in process on the following studies. The company from which the Armory hopes to obtain each study is listed herewith: (a) Rifle, U. S. caliber .30 M1 and Carbine, caliber .30 M2 (Winchester Repeating Arms Company); (b) Lined and plated caliber .50 barrels (Colt's Manufacturing Company); (c) Gun, submachine, caliber .45 M3A1 (Savage Arms Corporation). Additions to this program are expected in the near future. You will be kept advised of changes as they occur."

Comments and recommendations on this program have been submitted by the committee in response to a request from the Commanding Officer of the Armory.

Steel Tube Engine

Weighs only 59 pounds
develops 26.5 horsepower



Cross-section of Crosley Cobra engine built with U·S·S Shelby Seamless Alloy Steel Tubes for cylinders. The engine is now used for cars, motor boats and airplanes.

Sometimes a fresh viewpoint helps you solve a problem that has baffled you for months. That's what happened to the designer of this Crosley Cobra engine. To get rid of dead weight, he conceived the idea of building the engine block from steel tubes and steel stampings bonded together in an inseparable whole.

The Cobra has been called one of the outstanding advances in 40 years in internal combustion engine design. Because of its construction, each part can be inspected separately and tolerances rigidly controlled.

The steel cylinder barrels are made from U·S·S Shelby Seamless Alloy Tubing and their use makes it possible for the engine to develop high compression and high speeds without developing hot spots which cause pre-ignition and loss of power.

The use of seamless steel tubes in place of castings and forgings has cut thousands of pounds of dead weight from mobile equipment and saved millions of pounds of steel . . . but there are still innumerable opportunities for greater savings. It may be that tubular construction can help you solve the problem of greater strength with less weight. Our engineers will gladly cooperate. Write for more information.

NATIONAL TUBE COMPANY
PITTSBURGH, PA.
Tubing Specialties Division

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Export Company, New York

UNITED STATES STEEL

Communications

AGAINST HEAVY WEAPONS

The Editor.—The following statements are based on experience gained while a member of III Army forward Ordnance troops and while in the United Kingdom Base Section in Scotland and England.

Recent articles in Ordnance plus the Army demonstrations held at the Aberdeen Proving Ground last year show that Ordnance has a tendency toward big items—huge trucks, huge transporters, big guns, and mortars.

I do not know who has caused the swing toward this heavy material. Perhaps it does look good on paper and for propaganda reasons, but many young line officers of the tank and artillery corps who actually have to use this equipment will advise against it.

Points against this cumbersome material are obvious. First, of course, there is the manufacturing cost and development expense. Secondly, the supply of maintenance parts is a vast problem, and when parts are big, heavy, and scarce the problem is insurmountable and a handicap to the troops in the field. Every odd-type vehicle with a moving army is a definite disadvantage to the supply and maintenance teams and to the using arms.

The third and most important problem of heavy material is mobility, for mobility is the key to success in today's wars of pincer movements and spearhead drives. No one can pick out another country in the world where the mobility aspects are as good as those of the United States, and yet it is a problem even in our country to move oversized vehicles and guns.

Many of us remember the very narrow winding roads, steep hills, and dense forests of overseas battlefields. We also recall the burned-earth policy of the enemy which to the Army man means that every bridge is demolished and all the road blocks possible are used in stopping the advance.

It is easy to recall the big vehicles of the German Army—huge guns, heavy Tiger tanks, track-laying personnel carriers—as sitting targets because what gas they had was used up before they could reach a safe haven. A good many men have cursed the Army for equipment that bogs down or breaks down every few miles—and today a single campaign may cover many hundreds of miles.

Even small companies of Ordnance troops burdened with tank transporters have to plan and make two movements instead of one when ordered to move forward. Heavy material has to move by itself far behind and by roundabout ways to come up to the main body of troops, and by the time it does arrive it's time to move again. When this beautiful heavy piece of equipment does break down, all the advancing army can do is move it out of the way to lie and rust. It is bad to waste the country's money on cumbersome material, but it's a crime to burden fighting troops with it.

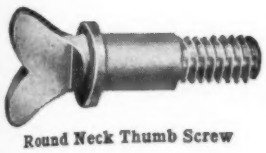
Recall the incident at the Ordnance demonstration last year. A heavy, new, good-looking truck was going to drive through a mudhole. Right there on the proving grounds it took two other trucks to pull the new one out of the mud. There it was—a laugh for the crowd. In a battle area it would be a sitting target or a rotten job for men and other equipment, and if such a thing happened in a convoy it would endanger hundreds of lives and valuable equipment.

Recall the ¾-ton 4 x 4 command car: field officers soon asked for the light, fast, dependable ¼-ton rather than trust their lives to the clumsy ¾-ton. (*Continued on p. 414*)

OHIO THUMB SCREWS

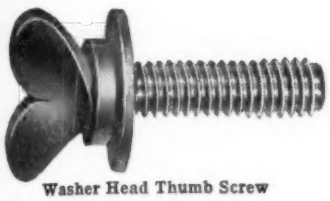
Shoulder Thumb Screw

Standard sizes are # 10-24x5/8 up to 1/2-13x4. Length is measured from under the shoulder to the end of the screw.



Round Neck Thumb Screw

In production quantities Thumb Screws are made with deep large diameter necks or with narrow wings.



Washer Head Thumb Screw

They are also made with large washer heads.

For samples and information write to

THE OHIO NUT & BOLT COMPANY

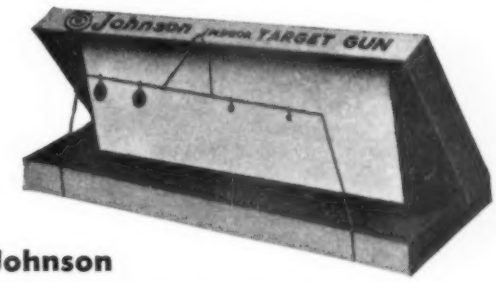
638 Front St., Berea, O.

Serving America and Americans with quality petroleum products

GULF

GULF OIL CORPORATION
GULF REFINING COMPANY
General Offices · Pittsburgh, Pa.

Shoot INDOORS
—Safely! —Accurately! —Inexpensively!



with the Johnson

Indoor Target Gun

The Johnson Indoor Target Gun is accurate to a degree that will astound you—at indoor ranges it will shoot as close as you can hold with a bench rest! Military sights, adjustable for elevation and windage, and a crisp trigger squeeze make the gun a really fine target device.

IT'S SAFE! The pellet from a Johnson Gun won't break the skin on your hand—or imbed itself in the wall. Shoot it indoors *without worrying* about damage, or ricochets. The packing carton is set up with a curtain which makes a safe, efficient backstop and target frame!

IT'S INEXPENSIVE! The special, polished-steel pellets (65 come with the gun) can be used over and over without loss of accuracy.

IT'S ONLY $15

Order from

THE AMERICAN ORDNANCE ASSOCIATION
705 Mills Building, Washington 6, D. C.

Gun comes to you postpaid, complete with

- Pellets
- Extra propulsion units
- Extra pellet carrier
- Paper targets
- Metal swinging targets
- Backstop and target frame

AMERICAN ORDNANCE ASSOCIATION
705 Mills Bldg., Washington 6, D. C.

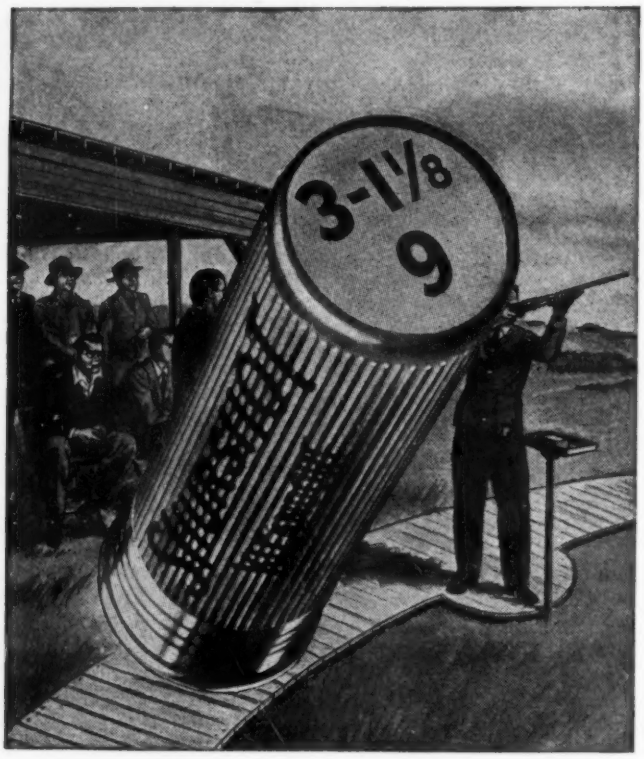
I enclose $..... Please send me, postpaid, ... Johnson Indoor Target Guns at $15 each.

Name (please print)

Street

City, Zone, State

For Higher Scores at Skeet



Shoot Remington "Shur Shot" Shells with New Flat Top Crimp

No more blown patterns! That's why Remington Shur Shot shells with the Remington Flat Top Crimp make skeet even more fun—scores even higher. This remarkable development by Remington is constructed so that there is nothing to obstruct the shot charge. The Remington Flat Top Crimp leaves no "holes" or thin areas in the pattern for targets to slip through. Remington Shur Shot shells back up your shooting skill every time.

Remington Shur Shot shells have exclusive Kleanbore non-corrosive priming and uniform velocity to get the shot pattern out there *fast*. Also exclusive green, corrugated bodies, progressive burning powder, improved wet-proofing, and patented top seal.

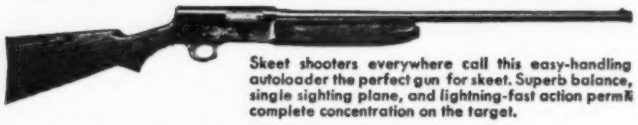
Made in 12-, 16-, and 20-gauge skeet loads and 12-gauge trap. For free literature, write Remington Arms Company, Inc., Bridgeport 2, Conn.

Remington

DUPONT

"If It's Remington—It's Right!"

Here's the Smooth-Swinging "SPORTSMAN"



Skeet shooters everywhere call this easy-handling autoloader the perfect gun for skeet. Superb balance, single sighting plane, and lightning-fast action permit complete concentration on the target.

Kleanbore and Sportsman are Reg. U. S. Pat. Off.; Shur Shot is a trade mark of Remington Arms Co., Inc.

Communications

As the Navy found light, fast torpedo boats a match for cruisers and even battlewagons, let the Army find some good, dependable, standardized, light, fast equipment to do the job best.

Utica, N. Y. JAMES E. PLUMB, JR.

THE BUSINESS LETTER—BOUQUETS

THE EDITOR.—Like most department heads in college, I belong to too many societies and associations. However, during my brief membership in the American Ordnance Association I have gotten more inspiration and ideas from your publications than all the rest put together.

I enjoyed greatly Mr. Gallaher's A.O.A. Business Letter, "Advice to a Young Man from an Older One." Attached is my personal check for twenty-five copies. I am in charge of the twenty-five student chapters, American Society of Civil Engineers, in the Southern Region. Please tell Mr. Gallaher that we are reading his letter to our seniors at a special session. I am going to forward a copy to the faculty adviser of each chapter under my guidance with the request that it be read to the seniors. It is fine, sound advice. You are doing a fine job. Keep it up.

R. A. MARR, JR.
Professor of Civil Engineering, V.M.I.

Lexington, Va.

THE EDITOR.—We wish to express our appreciation for your A.O.A Business Letters as prepared by E. B. Gallaher. They have been helpful, make business planning a little more interesting, and give a more secure feeling, which most businessmen seem to need today.

ELMER WILHARM
Farmers Produce Company

Tripoli, Iowa.

THE EDITOR.—Please send me twenty-five copies of Mr. Gallaher's February 1948 Business Letter No. 19. In my opinion, this letter has more sound advice in it than all the books and lectures that I got in college. I am going to distribute it to the young men now working in my departments and to the sons of my friends.

R. G. NIGHTINGALE
Chief Engineer, Colson Corporation

Elyria, Ohio.

. . . AND A BRICKBAT

THE EDITOR.—Must our Business Letters have a political slant? Personally I feel that Mr. Gallaher's anti-Administration snipes are out of place. That I disagree with many of these snipes is immaterial; that they are *political* is material.

We stand for scientific and industrial preparedness. The aims and purposes of our Association do not include internal political objectives, nor should they. It is our duty as private citizens to take vigorous part in the political life of the Nation, but the American Ordnance Association has no such duty. We do not want a Republican Party American Ordnance Association and a Democratic Party American Ordnance Association. That would not be in the interests of the United States.

Having spent four of the last six years out of the U.S. I am perhaps a little more sensitive than most to political slanting in what foreigners often regard as official U.S. publications. Right now I am particularly sensitive. From this spot the Marshall Plan dollars of 1948 appear the successors of the Infantry divisions and AAF wings of 1944 and 1945.

S. W. CONNELLY

Stockholm, Sweden.

McCORD

GASKETS—metallic, asbestos, steel, cork and treated paper for cars, trucks, tractors, and marine, gasoline and Diesel engines. Catalog lists over 10,000 sizes and types.

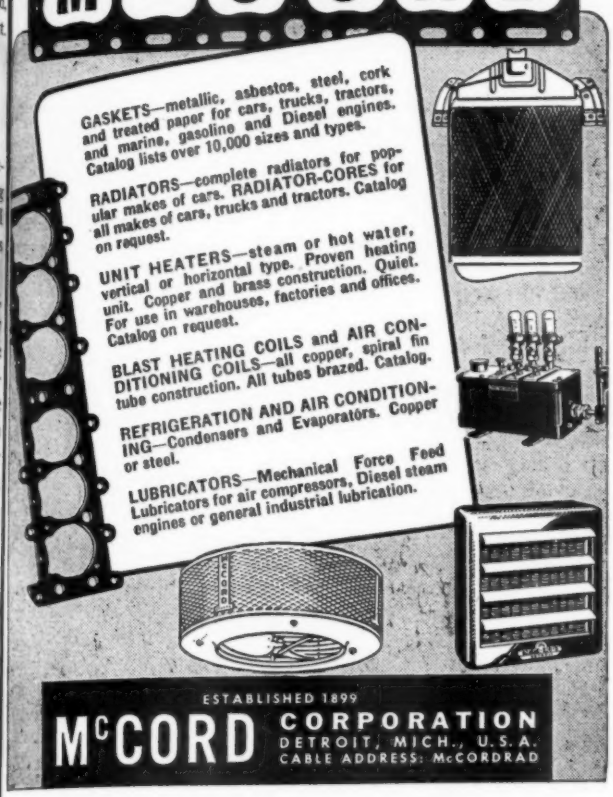
RADIATORS—complete radiators for popular makes of cars. RADIATOR-CORES for all makes of cars, trucks and tractors. Catalog on request.

UNIT HEATERS—steam or hot water, vertical or horizontal type. Proven heating unit. Copper and brass construction. Quiet. For use in warehouses, factories and offices. Catalog on request.

BLAST HEATING COILS and AIR CONDITIONING COILS—all copper, spiral fin tube construction. All tubes brazed. Catalog.

REFRIGERATION AND AIR CONDITIONING—Condensers and Evaporators. Copper or steel.

LUBRICATORS—Mechanical Force Feed Lubricators for air compressors, Diesel steam engines or general industrial lubrication.



ESTABLISHED 1899

McCORD CORPORATION
DETROIT, MICH., U. S. A.
CABLE ADDRESS: McCORDRAD

SWEEPING ECONOMIES

with FULLER FLOOR BRUSHES

Sweep Better Last Longer . . .

- Selected filler materials including high grade bristle, stiff horse tail hair and selected fibers.
- Full, firm sweeping surface wears down evenly.
- Long trim sweeps clean — wears longer.
- Widths from 12" to 36".
- Solid, polished hardwood blocks — two threaded handle holes.
- For the best in industrial sweeping, make sure you get Fuller Wood-back Floor Brushes.

TELEPHONE your Local Fuller Branch Office or write

The FULLER BRUSH Co.
INDUSTRIAL DIVISION
3585 Main St. • Hartford 2, Conn.

For General Pre-determined Weighing . . .

The EXACT WEIGHT Iron Horse employs the well-known over-and-under weight principle for check-weighing and general predetermined weighing purposes. Such features as short platter fall . . . long indicator travel for accuracy and speed . . . dustproof dashpot protection . . . all working parts enclosed . . . weighing accuracy unaffected by out-of-level floors and machinery vibration . . . 150 lb.-capacity—sensitive to one ounce over and underweight—all make this scale tremendously popular throughout all general industry. Write for complete details.

If you have operations calling for heavy-duty testing and checking write for EXACT WEIGHT "Iron Horse" specifications.

INDUSTRIAL PRECISION
Exact Weight Scales

THE EXACT WEIGHT SCALE COMPANY
West Fifth Avenue, Columbus 12, Ohio
Dept. W, 783 Yonge St., Toronto 5, Canada

HEIL *Quality* PRODUCTS

Bodies & Hoists
Transport Tanks
Road Machinery
Heating Equipment
Dehydrators
Bottle Washers
Water Systems

Serving the world with equipment for

1. *Better Foods*
2. *Better Homes*
3. *Better Roads*
4. *Better Transportation*

A-11

THE HEIL CO.
GENERAL OFFICES • MILWAUKEE 1, WISCONSIN

APPROVED UNDER NEW
COAST GUARD SPECIFICATIONS-24 OCT., 1947

DAYNITE
SMOKE
FLARE
DISTRESS SIGNAL
Only DAYNITE SIGNALS provide protection day and night—vivid orange smoke visible in broad daylight to patrol planes and cutters PLUS brilliant night flare visible to the horizon and beyond.
★ 1,500,000 Delivered to U. S. Armed Forces. (identified as SIGNAL DISTRESS DAY and NIGHT MARK 13 MOD 0)
★ APPROVED by U. S. Coast Guard, Civil Aeronautics Administration, Air Transport Association, and many Foreign Governments.
★ OBSERVED from aircraft in Official U. S. Coast Guard test—33 miles
★ OBSOLETES pistol-projected, floating and paper-wrapped fireworks type signals
Double duty: combines orange smoke-signal and night flare in opposite ends of watertight steel container. Hand-held. Safe. Dependable. Visible when overcast would obscure pistol projected or roman-candle star signals.
U. S. Coast Guard
Approval No. 160.023/1/0
31 October, 1947
*DAYNITE T.M. Reg., Patents Applied For
AERIAL PRODUCTS, INC., MERRICK, L. I., NEW YORK

A basic and invaluable tool
for the ordnance engineer

ELEMENTS OF AMMUNITION

By
Major
Theodore C. Ohart
Ordnance Department, Army of the United States

Here is an authoritative and detailed source of information on modern ammunition. It describes clearly and simply the various phases of ammunition design and development. All types are covered, including the main categories of small arms, artillery, aircraft, and rocket ammunition. Includes Bazookas; Beach Barrage Rockets; Long Range Artillery; Block Busters; Chemical Warfare Ammunition; Fire Bombs.

1946 412 pages $6.00

ON APPROVAL COUPON

JOHN WILEY & SONS, INC.
440 Fourth Ave., New York 16, N. Y.

Please send me, on ten days' approval, a copy of Ohart's ELEMENTS OF AMMUNITION. If I decide to keep the book, I will remit $6.00 plus postage; otherwise I will return the book postpaid.

Name .....
Address .....
City ..... State .....
Employed by .....
(Offer not valid outside U.S.) 0-5-48

Book Reviews

Review Staff

BRIG. GEN. DONALD ARMSTRONG, *military historian, lecturer, author, New York, N. Y.*

COL. GEORGE S. BRADY, *consulting engineer, author, editor, Washington, D. C.*

F. W. FOSTER GLEASON, *military historian, ordnance analyst, editor, Washington, D. C.*

LIEUT. COL. CALVIN GODDARD, *small-arms authority, Tokyo, Japan.*

MAJ. MELVIN M. JOHNSON, JR., *automatic arms expert, inventor, author, Boston, Mass.*

BRIG. GEN. R. H. SOMERS, *engineer, ballistician, author, editor, Dover, N. H.*

COL. THOMAS K. VINCENT, *artillerist, engineer, author, Greisheim, Germany.*

DR. JOHN J. O'CONNOR, *educator, author, editor, Washington, D.C.*

THE PRICE OF POWER. By Hanson W. Baldwin. New York: Harper & Brothers. 361 pp. $3.75.

ELSEWHERE in this issue of ORDNANCE a digest of Mr. Baldwin's chapter on "Economic Mobilization" is published. In his extremely effective survey of a recommended military and foreign policy for this country in the light of modern power politics, it is gratifying to observe the emphasis on this subject.

It is even more gratifying to find a military expert who understands the importance of industry in war. When Mr. Baldwin writes that "the big factories of America won the war," he sets the keynote for his views on this subject. When he adds later on that economic mobilization "holds the key to future victory and it can affect more basically than any other security measure the lives and liberties of all of us," he states facts that we of the American Ordnance Association have long held to be self-evident.

Mr. Baldwin writes for the layman, but with a sound knowledge of technique and tactics of modern warfare. There are excellent chapters not only on economic mobilization but on intelligence, research and development, dispersion and decentralization of industries and cities. On the matériel side, his discussions of the atomic bomb, long-range missiles, new modern submarines, new gases, and the possibility of biological warfare suggest the difficult strategic problems facing this country.

Civilian control of economic mobilization planning and performance is the doctrine that has been taught at the Industrial College of the Armed Forces since its establishment. The inference, therefore, that the armed forces seek to control the economy either in peace or war is hardly tenable, even if the struggles of military and naval officers to secure the materials and labor needed to meet military requirements might have indicated excessive zeal. Certainly the record of the Industrial College and the Ordnance Department both before, during, and since the war provide convincing evidence that civilian aid and advice have been sought on every possible occasion.

Mr. Baldwin's book, however, achieves most successfully its objective of examining the significance of the technological and

The Ordnance Book of the Month

THE PRICE OF POWER

By Hanson Baldwin

Mr. Baldwin, well-known military and political analyst, compares the United States and Russia today, and tells what must be done to prevent a war between the two nations. The economic potentials, the vulnerability of industry and transportation to attack, our air strength, and atomic research are thoroughly studied. Retail $3.75. To members $3.19.

THE INDUSTRY-ORDNANCE TEAM

By Lieut. Gen. Levin H. Campbell, Jr.

General Campbell's background as chief of the ordnance program for World War II makes him well qualified to write this fascinating story of the astounding work of procurement and production carried on by the joint effort of Ordnance and industry in arming the freedom-loving nations of the world. A necessary book for the Ordnanceman. Retail $5.00. To members $4.00.

PSYCHOLOGICAL WARFARE

By Paul M. A. Linebarger

A handbook of the methods of propaganda dissemination and analysis by a man who has worked as civilian expert and Army officer for five years at psychological warfare. It is a book for free men everywhere which tells how to recognize propaganda, how to defend against it—and how to organize propaganda for our side. Retail $3.50. To members $2.97.

ON ACTIVE SERVICE

By Henry L. Stimson and McGeorge Bundy

The story of one of America's greatest public servants. Field Artillery officer, Secretary of State, Secretary of War in two Administrations, Henry L. Stimson has the background and the inside knowledge which make great history and great biography. Retail $5.00. To members $4.25.

AIRBORNE WARFARE

By Maj. Gen. James M. Gavin

In his book General Gavin reviews the airborne operations of World War II. He uses his experience and the products of his intensive survey and research to set up a suggested organization for airborne troops. From these sources are drawn his opinions on the future of airborne warfare. Retail $3.00. To members $2.55.

I SAW POLAND BETRAYED

By Arthur Bliss Lane

A full report on the Polish situation—what was done to the Poles, how Communists dominate that country, and how their tactics of infiltration brought about the downfall of Free Poland. Mr. Lane resigned as Ambassador to Poland so he could tell the full story. Retail $3.50. To members $2.97.

RECOMMENDED

	Retail	*To Members*
HORNED DEATH *By* John F. Burger	$6.50	$5.52
WAR AS I KNEW IT *By* Gen. George S. Patton, Jr.	3.75	3.19
ELEMENTS OF AMMUNITION *By* Theodore C. Ohart	6.00	5.10
A STUDY OF HISTORY *By* Arnold J. Toynbee	5.00	4.25
BARBED WIRE SURGEON *By* Alfred A. Weinstein, M.D.	3.00	2.55
COMPANY COMMANDER *By* Charles B. MacDonald	3.00	2.55
FRANCE: Paris and the Provinces Text by Roger Roumagnac Gastronomy by Pierre Andrieu Translated by Marguerite Bigot and Madeleine Blaess	4.50	3.82

ORDNANCE BOOK SERVICE
705 Mills Building, Washington 6, D. C.

Please send me, postpaid, the following books:*

.....

.....

.....

Name .....
(please print)

Address .....

City, Zone, State .....

**I certify that I am a member of the A.O.A.*

AMERICAN ORDNANCE ASSOCIATION
705 Mills Building **Washington 6, D. C.**

★ ★ ★ ★ ★ ★

44 YEARS OF
Spicer
SERVICE

UNIVERSAL JOINTS
★ ★ ★
PROPELLER SHAFTS
★ ★ ★
TRANSMISSIONS
★ ★ ★
TORQUE CONVERTERS
★ ★ ★
POWER TAKE-OFFS
★ ★ ★
PASSENGER CAR AXLES
★ ★ ★
PARISH FRAMES
★ ★ ★
CLUTCHES

SPICER MANUFACTURING
Division of Dana Corporation
TOLEDO 1, OHIO

ARMSTRONG CORK COMPANY

Manufacturers of over 360 different products for home and industry

ARMSTRONG CORK COMPANY
Lancaster, Pennsylvania

Book Reviews

political revolution that has occurred in the last decade. Th effects on the strategic position of the United States and upo our military and foreign policy are carefully analyzed. Thi book should be studied by every reader of ORDNANCE and, it i to be hoped, by the widest possible audience of American citi zens. Mr. Baldwin deserves the thanks of all patriotic American for the thoughtful and careful analysis of the dangers we fac and of the recommended solutions for avoiding war or winnin a victory if war is forced upon us.—DONALD ARMSTRONG.

PRINCIPLES OF FIREARMS. By Charles E. Balleisen. New York: John Wiley & Sons. 146 pp. $2.50.

THIS is an excellent treatise in simplest terms of the techniqu incident to the design, operation, and functioning of firearms. I is a textbook in the best meaning of the word and should fin many ready users in all educational fields where the basic tech nical principles of firearms are studied and applied.

The author has an enviable record as an officer of the Ord nance Department, U. S. Army. By reason of his innate ability fortified by valuable experience during World War II, he is well-equipped to describe in understandable language the purpos he set out to achieve in this book.

In his own words his mission is: "To expound the concept tha an automatic firearm is a piece of machinery operating in ac cordance with well-known laws of physics and hence capable o being analyzed and designed in accordance with common en gineering practice. This approach to the subject is believed t be new in this country, although much similar material has bee published in France and Germany. Thus, the source materia available in this country to engineers who are called upon t design weapons is either in the French or German language o exists in only very limited quantities." Major Balleisen has done a notable piece of work for which all students of firearms, presen and future, will be grateful.—L. A. CODD.

NOW HEAR THIS! By John J. Motley and Philip R. Kelly. Washington: The Infantry Journal Press. 282 pp. $4.

WE are too close to the war, by many years, to look for an finished history. Yet, when it does come, builded on the bones which are official papers and subsequent revelations, it must be clothed with the live flesh of action narrative. It is this function which gives such a book as this its importance.

The authors have chosen as their medium a series of several hundred vignettes—each a high-lighted and personalized story of a ship. Searching the Navy's files and relying heavily on naval and Presidential citations, representatives of all types from battlewagons and flattops to tankers and tugs were selected. Facts of each story are official but are supplemented by thou sands of interviews, letters, and diaries.

The success of this presentation is, of course, aided by the "personality" possessed by a ship. No man can fall in love with a fort or camp, but few indeed fail to fall in love with their own "the best damn ship in the Navy." The need for unity of com mand and teamwork between the services is well exemplified throughout. Several historical and ship tables add research value to a book that few can read without a quickening pulse.—F. W. F. GLEASON.

THE ARMED FORCES AS A CAREER. By North Callahan. New York: McGraw-Hill Book Company. 334 pp. $3.

AMERICAN youth wants to know what a career offers in the way of security, pay, and other advantages. He wants to know the meaning and significance of the job itself. Colonel Callahan offers our young people an integrated, up-to-date compilation of all pertinent data on careers in the Army, Navy, Coast Guard and the Marines.—JOHN J. O'CONNOR.